THE IRON TRADE REVIEW

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DECIDED STAND

AGAINST BIG ADVANCE IN ORE PRICES TAKEN BY CLEVELAND INTERESTS.

Coke Quotations Declared Unreasonable and Dangerous to Prosperity—Pig Iron Firm—Car Orders Very Large.

Interest again centers in raw materials, and conservative business men are sounding a note of warning that there is real peril in the present tendency to advance prices. The strong influence working against a runaway market has, however, been shown recently in the decision not to advance the price of plates and other finished products, and this week two of the largest ore concerns in Cleveland, which are also identified with the manufacture of iron, have stated in a very positive way that they are opposed to advancing the price of ore for 1906 more than 25 cents per ton. They point to the disastrous results which followed the heavy advance of ore prices in 1900 after a period of prosperity in 1899, and say that sellers will not be wise if they do anything which will bring about a repetition of the experiences of five years ago. As there is no longer an association for the control of ore prices, it seems practically certain that the conservative Cleveland interests referred to will establish the market for next year.

Coke Prices Very High.

The coke market is in a feverish condition, and buyers are objecting strongly to what they declare are unreasonable prices now being asked. Some large sellers are out of the market for prompt shipment and extremely high quotations are made on spot coke. For the first half of next year $3 for furnace and $3.50 for foundry coke are the usual prices asked; but practically no contracting is being done at these quotations. In some cases lower quotations have been made for the second half to encourage contracting for the entire year, but this plan has not been received with favor. Car shortage is an increasingly important factor in the coke business, and is causing more trouble to manufacturers of iron and steel.

More Coke Capacity.

On account of the present conditions of the coke market there is a marked renewal of activity in coking operations. Large tracts of coal land are being placed on the market, generally at very high figures. Some important iron and steel interests which have their own coal supplies are preparing to add largely to their coke making capacity. One company will build about 400 ovens, and the Toledo Furnace Co., which has decided to erect a second stack at its plant, will also build a by-product coke plant.

Pig Iron Is Firm.

The pig iron market is rather quiet, so far as actual transactions are concerned, but it is fully as firm and prices are tending upward. Bessemer is established at $16, valley furnace, while No. 2 foundry commands $16 to $16.50, and it is difficult to get basic at less than $16. Southern prices have been advanced and sales are now being made at $13 to $13.50 for No. 2, Birmingham. Many furnacemen express the opinion that pig iron will soon be selling at $18, valley furnace, but even a higher price may be expected if the high quotation of $3 for foundry coke should be established, as the old ratio of seven to one would indicate a price of $21 for pig iron.

Heavy Buying of Cars.

One proof of the extent to which the railroads are to be credited with present prosperity is found in the fact that the Pressed Steel Car Co. will, with the beginning of the new year, get from the Carnegie Steel Co. about 65,000 tons monthy of rolled steel products, an increase of 20,000 tons above the amount now received. Car manufacturers report that they are crowded with orders. The American Car & Foundry Co. has unfilled contracts aggregating more than 60,000 cars, and the order from the Pennsylvania lines for more than 20,000 steel cars in addition to the 16,000 ordered in August, together with orders from many other companies, will tax the capacity of steel car plants for all of 1906.

Continued Activity.

In finished lines prosperity continues without events of special importance. The prices of nuts and bolts have been advanced about 10 percent. It is expected that orders for 60,000 tons of structural material for New York buildings will be placed during the next 30 days. There is a strong demand for plates in the East, but premiums are not paid as a rule. The demand for rails continues good. Numerous small lots of 2,000 tons have been closed. A number of large tonnages pending are to be closed within a week. The B. & O. requirement, 75,000 tons, is not yet closed. Among the sales are: Tidewater, 12,000; Mississippi Central, 8,000; Great Northern and Lake Shore, each 5,000 additional.

THE WEEK IN IRON CENTERS.

PITTSBURG.

Keen Interest in Finished Materials—Many Furnaces Refuse to Quote.

OFFICE OF *The Iron Trade Review*,
521 PARK BUILDING, October 24.

Interest has shifted from finished products to raw materials. The coke and pig iron markets are very much excited. Connellsville furnace coke has advanced to $3 at ovens for first half, and is very hard to get at that. Many furnaces are refusing to quote on pig iron for delivery next year until the coke situation is more settled. Bessemer pig is firmly established at $16, valley, by several sales since the steel corporation purchase, and it is rumored that $16.50 has been done, for delivery beginning Jan. 1.

The coke question is one of regular car supply rather than of productive capacity, since the capacity was sufficient to keep the furnaces going last spring, and also lately, at a rate which cannot be exceeded this winter. Car supply has been bad lately, and is expected to be much worse at times this winter. With poor coke supply, and the various vicissitudes in furnace operations in the winter, furnacemen think it probable rather than otherwise that production will be seriously curtailed, and expect a much higher market on pig iron, say $18 at furnace, to be reached before the year is out.

The finished steel markets are very steady, with a moderately large volume of business being currently booked. The tonnage is much less than it was in September. The mills are very well sold up, and rather welcome the easing up.

There is now no likelihood of any advance in either plates or merchant steel bars for the present, or before the end of the year, if at all. It is held that not much would be gained by an advance at this time, the mills being sold so far ahead, and with less new tonnage coming in. If an advance is called for, it can be made just as well later on.

On account of the increase in capacity it is making, the Pressed Steel Car Co. is concluding new arrangements for tonnage with the Carnegie Steel Co. on its old contracts. Beginning with the new year, the Pressed Steel Car Co. will get from the Carnegie Steel Co. about 65,000 tons monthly of rolled steel products, chiefly plates and merchant bars, against about 45,000 tons monthly at present. This is arranged on old contracts, the only change being as to the tonnage. The Pressed Steel Car Co. has been turning out about 90 cars a day, and with the improvements it will have a nominal capacity of about 150 cars daily. It will then be consuming materials representing the equivalent of fully 1,000,000 tons of pig iron annually, and will thus be the largest fabricator of iron and steel products in the world, from a tonnage standpoint.

Pig Iron.—Since the United States Steel Corporation bought 40,000 tons of Bessemer pig, at $15.50, valley, for the half to be delivered in October and $16 for the half to be delivered in November, the Bessemer market has become firmly established at the latter figure as a minimum, between 5,000 and 10,000 tons having been sold at $16, valley, for deliveries the balance of this year. The sales have been comparatively light, as have been sales of foundry and forge grades, and the advance in the market is due to other circumstances. There is now scarcely any unsold iron for the balance of this year, and furnaces being confronted with much higher coke costs, Connellsville furnace coke being now at a minimum of $3 on contracts for first half, as well as with the prospects of curtailed production at times during the bad weather, are indisposed to name prices just now for next year. The firm opinion is expressed by furnacemen that $18 iron is well in sight. Foundry iron is quite firm at $16 to $16.50, furnace, for No. 2 from regular producers for good delivery. It is possible that some odd lots of Bessemer, basic and foundry might be picked up at a little less than $16, but the tonnage is small and deliveries would not be certain. We revise quotations as follows:

Bessemer, Valley	$16.00 to $16.50
Bessemer, Pittsburg	16.85 to 17.35
No. 1 Foundry, Pittsburg	17.35 to 17.85
No. 2 Foundry, Pittsburg	16.85 to 17.35
Gray Forge, Pittsburg	15.60 to 15.85
Basic, Valley	15.75 to 16.25
Basic, Pittsburg	16.60 to 17.10

Ferro-Manganese.—The market continues very firm, deliveries for this year being extremely hard to get, with $62 as a minimum, and most sellers quoting close to $65. There is no definite market established for next year. The report is denied that the local producer has changed any of its ferro capacity to standard pig, as while ores are not coming in very freely, and it has made large purchases of ferro on the outside, it still needs all the ferro it can make.

Billets.—A very large tonnage of Bessemer and open-hearth billets could be sold very easily if any moderate price could be made, but prospective consumers cannot afford to pay fancy prices, and the market is comparatively quiet so far as actual transactions are concerned. Bessemer billets can be quoted at about $26, f. o. b. Pittsburg, for delivery this year, and open-hearth billets at $27 to $28. Forging billets are held at about $30 where they can be quoted at all. Sheet bars are nominally about $27 in long lengths. There is scarcely any interest in the sheet bar market, consumers being supplied on contracts of various sorts, chiefly from the leading interest. Two contracts which independent sheet and tin mills had with an outside steel producer were recently transferred to the leading interest, which is now supplying nearly all the sheet and tin plate bars consumed by independent mills which do not make their own.

Muck Bar.—The market is quiet, producers being well sold up and quoting $28.25 to $28.50.

Skelp.—About all the spare production is sold to the end of the year and the market is quiet, but very firm. We repeat previous quotations:

Bessemer steel, grooved, 1.55c; sheared, 1.60c; open-hearth, grooved, 1.60c; sheared, 1.65c; iron, grooved, 1.60c to 1.65c; sheared, 1.65c to 1.70c.

Rails and Track Material.—The Baltimore & Ohio orders aggregating 71,000 tons, mentioned last week, have been placed, the local mill getting about half the total. Otherwise comparatively little new tonnage has been booked by the local mill. Light rails continue in excellent demand, and premiums can be obtained for early delivery. On late delivery our recent quotations prevail, but on light rails for quick shipment a premium of $1 a ton can easily be obtained on 25 to 45-lb. sections. The rerolling mills are getting a much larger share of the business than formerly. Spikes are well maintained at the advanced price of $1.99 quoted last week. We quote:

Fifty pounds and heavier, 500-ton lots and over, $28; carload lots and less than 500 tons, $30; less than carload lots, $32; light rails, 16-lb., $29 to $30; 20-lb., $27.50 to

$28; 25 to 45-lb., $26; angle bars for standard sections, 1.50c; spikes, $1.90 to $1.95.

Plates.—Last week the Pennsylvania railroad system placed the balance of its steel car order, totaling 21,000 cars, and making with the previous orders, placed about a month earlier, a total of about 38,000 cars ordered by the Pennsylvania system, for delivery next year. The Pressed Steel Car Co. got 13,000 of the cars ordered last week. This company will take monthly, beginning with the first of the year, about 65,000 tons of rolled steel products from the Carnegie Steel Co., chiefly plates. Since the meeting of plate mills Tuesday of last week made no change in prices, it is not likely that anything will be done with prices for the present. The matter will be canvassed again about the close of the year. We continue to quote:

Tank plate, ¼ in. thick, 6¼ in. to 100 in., 1.60c f. o. b. mill Pittsburg. Extras are as follows per 100 lb.: Flange and boiler steel, 10c; marine, A. B. M. A. and ordinary fire box, 20c; still bottom, 30c; locomotive fire box, 50c; plates over 100 in. up to 110 in. in width, not less than 5c extra; plates 110 in. to 115 in. wide, not less than 10c extra; 115 to 120 in., 15c extra; plates 120 in. to 125 in. wide, not less than 25c extra; plates 125 in. to 130 in., not less than 50c extra; plates 130 in. wide, not less than $1 extra; plates 3-16 in. thick, 10c extra; gauges 7 and 8, 15c extra; No. 9, 25c extra. Five cents extra for less than carloads. Terms net cash in 30 days, and for all points of delivery in the United States except Pacific Coast.

Merchant Bars.—There is a little trouble about deliveries, on account of car shortage. Occasionally slight premiums are paid for small lots, but in general business is done at base prices, 1.50c on steel bars, Pittsburg, and 1.70c, Youngstown, for iron bars. With the high prices for scrap, and possibilities of still higher prices this winter, an advance in iron bars would not be improbable. The iron bar manufacturers have been hoping that the steel bar mills would advance prices, but this is quite unlikely now, and iron bars cannot get much farther away from steel bars than they are now. We continue to quote:

Common iron bars, 1.70c, Youngstown; 1.75c, Pittsburg; hoops, 1.75c, and bands, 1.50c; taking hoop and band extras, respectively. Bessemer steel bars, 1.50c; open-hearth steel bars, 1.50c; plow and cultivator, 1.50c, net; channels, angles, zees and tees under 3 in., 1.60c, all f. o. b. Pittsburg. The following differentials are maintained on steel: Less than 2,000 lb., 10 cents advance; less than 1,000 lb. of a size, 30 cents advance.

Structural Material.—There continues to be considerable booking for next year. Demand will keep upright through the winter, despite weather conditions interfering with outside erection, as stocks in fabricators' and dealers' hands are almost depleted, and must be renewed. We continue to quote regular mill prices:

Beams and channels, 15 in. and under, 1.70c; over 15 in., 1.80c; zees, 1.70c; tees, 1.75c; angles, from 3 to 8 in. inclusive, 1.70c; universal and sheared plate, 6¼ in. and wider, 1.60c, base.

Sheets.—The market has become very firm, but has not actually advanced. The leading interest, as well as a few of the independents, continue to quote former prices, but all concessions are withdrawn. We quote the minimum on carloads, with desirable specifications, at 2.25c for black and 3.30c for galvanized, No. 28 gauge, while on the largest lots not under 2.20c and 3.25c could be done in any case. Some independent mills are naming 2.30c as an absolute minimum, and have obtained this price in several cases. Mills are not in receipt of as much tonnage as a few weeks ago, most large buyers having covered to the end of the year, but mills are quite comfortably filled up. Jobbing business has improved somewhat in the past week or two.

We quote the official prices as follows, these being quite nominal but well representing the differentials between gauges:

No. 30, 2.65c; No. 29, 2.55c; No. 28, 2.40c; No. 27, 2.30c; Nos. 25-26, 2.25c; Nos. 22-24, 2.0c; Nos. 17-21, 2.15c; Nos. 15-16, 2.10c; Nos. 13-14, 2.05c; Nos. 10-12, 2c. Galvanized, Nos. 10-11, 2.35c; Nos. 12-14, 2.45c; Nos. 15-16, 2.55c; Nos. 17-21, 2.70c; Nos. 22-24, 2.85c; Nos. 25-26, 3.05c; No. 27, 3.25c; No. 28, 3.45c; No. 29, 3.70c; No. 30, 3.95c. Quotations f. o. b. Pittsburg, 30 days net, 2 percent off cash 10 days.

Wire and Wire Nails.—Jobbers are fairly well covered, and are specifying very freely against contracts, both on account of improved demand and on account of the fear that there will be difficulty in getting good shipments later on. The mills are running to full capacity, except as occasionally hampered by scarcity of billets. We quote prices firm and unchanged as follows:

Wire nails, jobbers' carload lots, $1.80; retailers' carload lots, $1.85, and less than carloads, $1.95; painted barb wire, $1.95 for jobbers in carloads; retailers' carloads, $2, and less than carloads, $2.10, with 30c for galvanizing. Annealed smooth fence wire is held at $1.65, with the usual differentials to retailers for carloads and less than carloads. Quotations are all f. o. b. Pittsburg, 60 days, with 2 percent discount for cash in 10 days. Iron and steel cut nails, $1.70 to $1.75.

Merchant Steel.—Demand is good, with forward contracting and good specifications. We quote prices unchanged:

Cold rolled and ground shafting, 50 percent off in carload lots, and 45 off in less than carloads, delivered in base territory; tire steel, 1.0c; open-hearth spring steel, 2.25c to 2.50c; sleigh shoe flat, 1.50c to 1.55c; smooth finished machinery steel, 1.70c to 1.75c; toe calk, 2c to 2.05c.

Pipes and Tubes.—Merchant pipe continues in good demand, and all interests are operating to practically full capacity.

We quote discounts in carload lots to consumers as follows, prices to large jobbers being one point lower:

	Steel		Iron	
Consumers' Carloads	Black	Galv.	Black	Galv.
⅛ and ¼ inch	71	55	68½	52½
⅜ and ½ inch	75	63	72¼	60½
¾ to 6 inches	79	69	77	67
7 to 12 inches	74	59	72	56½
EXTRA STRONG PLAIN ENDS.				
⅛ to ⅜ inch	64	52	61½	49½
½ to 4 inches	71	59	68½	56½
4½ to 8 inches	67	55	64½	52½
Double extra strong plain ends, ½ to 8 inches	60	49	57½	46½

MERCHANT BOILER TUBES, CARLOADS, 22 FEET AND UNDER.

	Steel	Iron
1 to 1½ inches	44	41
1¾ to 2¼ inches	56	41
2½ inches	58	46
2¾ to 5 inches	64	53
6 to 13 inches	56	41

Less than carloads, two points less.

Old Material.—Prices have advanced sharply on some grades, due not so much to heavy buying on the part of consumers, as a shortage in supply. Large quantities of scrap have been absorbed right along by dealers who could not get out on the current market, but are expecting much higher prices in the winter, when they can unload at a good profit. Sales of heavy melting stock in the open market in this district since $16 was the regular price, say three weeks ago, have not been much over 10,000 tons, yet the price has advanced sharply to $17, where it is today. In this time two nearby consumers have bought say 5,000 tons apiece, for quick delivery, from dealers. It is rumored that one of them bought a considerably larger tonnage direct. There is no large block of melting stock

to be had even at $17, although a higher figure would probably bring out a good deal of scrap. Cast borings are higher, $10.25 being freely paid for ordinary borings, while heavy borings will bring up to $10.75. We now quote prices as follows:

Heavy melting stock, $17; low phosphorus scrap, $20 to $21; rerolling rails, $17 to $17.50; No. 1 cast scrap, $15.50 to $15.75; cast borings, $10.25 to $10.75; No. 1 wrought, $16.50 to $17.

Coke.—The coke market is very much excited. A number of furnaces are not yet covered for the first half of next year and are bidding higher prices without tempting producers, who are fairly well sold up. Two transactions were made today covering furnace coke which represented about $3 a ton, and less than this cannot be done on strictly Connellsville furnace coke for first half of next year. On the old ratio of seven to one this would represent $21 for pig iron, which is beyond the highest expectation of furnacemen. The high prices are due more to a fear of car shortage this winter than to any absolute shortage of productive capacity. Prompt furnace coke is unquotable, there being scarcely any offered. We quote strictly Connellsville 72-hour foundry coke at $3.50 minimum, some sellers asking considerably more than this for prompt delivery. Outside grades of coke are bringing relatively good prices. Production in the week ending October 14 is estimated at 274,558 tons for the Connellsville region, and 87,855 tons in the lower Connellsville region, or substantially the same as in the previous week.

CHICAGO.

Mills and Furnaces Crowded to Capacity—Pig Iron Prices Advance.

OFFICE OF *The Iron Trade Review*,
1161 MONADNOCK BLOCK, October 24.

The demand for metal in the West is almost despairing in its insistency. Every mill and furnace is crowded to its uttermost capacity, but the cry is still for more tonnage. Price has ceased to be an object with many consumers, and almost any reasonable premium can be obtained if the right deliveries can be given. This willingness to pay is one of the most serious features of the present situation, and nullifies every effort of the seller to hold the market down. Specifications are piling up in all offices, and appeals for anticipated shipments are so numerous that they have ceased to possess any virtue. As was generally expected, pig iron moved up to higher levels last week. Northern and Alabama furnaces advanced their prices 50 cents a ton, and Virginia stacks $1 a ton. This move has temporarily dulled the appetite for iron, which accomplishes the object the furnaces had in view in making it. The wisdom of not advancing billets, plates or structural shapes at the meetings of the various associations last week has created a favorable impression here and has steadied the market immeasurably. It has not altered the situation, however, nor abated the demand, which continues to surpass anything previously experienced. There is unwonted activity in all forms of finished material entering into the manufacture of rolling stock and agricultural implements. All the mills in this district have been on double turn for months, and though their entire output goes into immediate comsumption they are falling behind every day on their specifications. The demand for wire, merchant pipe and sheets is strong and prices are strengthening. Coke continues scarce and is firm at $3.50 Connellsville ovens for standard 72-hour grades. Scrap is stationary, having been held in check during the week by a number of local dealers who are sold short.

Pig Iron.—Trading last week was of a nominal character. With one or two exceptions all the big consumers are covered for their requirements, and "pick-up" orders form the bulk of transactions just now. There is little iron to be obtained even if there was a demand for it; and what is left unsold is being doled out in small lots to an ever-increasing number of melters who find themselves short on certain grades. The advances last week were another deterrent factor to any voluminous trading. Nearly all the Alabama furnaces are now on a $14 basis, the raise of 50 cents a ton having been made in the latter part of the week. Virginia furnaces are even higher, all of them having put up prices $1 a ton. These interests are now asking $18.15 Chicago for No. 2 foundry, or $15.50 furnace, which is equivalent to $14.50 Birmingham. Northern producers followed suit quickly, and those with iron to sell are offering same on the basis of $18 Chicago for No. 2 foundry. It is still possible in certain quarters to get Southern and Northern irons at about 25 cents a ton below these prices, but it is not expected this tonnage will last long. Southern basic and silvery irons have also advanced along with other grades, and both are scarce and firm at the new prices. We have revised our quotations as follows:

Lake Superior charcoal	$18.00 to 18.50
Northern Foundry No. 1	18.25 to 18.50
Northern Foundry No. 2	17.75 to 18.00
Northern Foundry No. 3	17.25 to 17.50
Northern Scotch Foundry	18.25 to 18.50
Ohio Strong Softeners No. 1	18.30 to 18.80
Ohio Strong Softeners No. 2	17.80 to 17.80
Southern Foundry No. 1	17.65 to 18.15
Southern Foundry No. 2	17.15 to 17.65
Southern Foundry No. 3	16.65 to 17.15
Southern Foundry No. 4	16.40 to 16.90
Southern No. 1 Soft	17.65 to 18.15
Southern No. 2 Soft	17.15 to 17.65
Southern Gray Forge	15.40 to 15.90
Southern Mottled	15.15 to 15.40
Southern Silveries (4 percent to 6 percent Silicon)	18.15 to 18.65
Jackson Co. Silveries (8 percent to 10 percent Silicon)	19.80 to 20.80
Alabama and Georgia Car Wheel	20.65
Malleable Bessemer	17.75 to 18.00
Basic Iron	17.65 to 18.15

Billets.—Negotiations were in progress in this market last week for a large tonnage of axle billets, but the inability to provide satisfactory deliveries sent the inquiry elsewhere. The local market is very firm, and forging billets are the only kind obtainable. These are quoted from $32 to $35, according to the conditions surrounding each order.

Bars.—Bar iron is in great demand and very stiff as to price. A number of large transactions involving railroad specifications have been closed within the last 10 days. So much tonnage is offered that sellers can pick their business according to their needs. Supplementary tonnages and requests for anticipated shipments are the order of the day, every seller being overwhelmed with orders of this character. The price is firm at 1.75c for large and desirable orders, and 1.80c for small business. No cessation is noted in the demand for steel bars. Judged by the large number of letters sent in, nearly every implement manufacturer must be begging for immediate shipment of his specifications. Mills are literally snowed under with surplus tonnage, and though operating night and day are falling further behind in deliveries. Prices are extremely firm, premiums of $2 a ton being obtained by some independent makers. We quote carload lots, mill shipments, Chicago delivery, soft steel bars and bands, 1.66½c, half extras; soft steel angles, less than 3 x 3, 1.76c; hoops, 1.91½c base, full extras. Hard steel angles, 1.60c to 1.65c. Demand from store is heavy and prices are firm. We quote bar iron, 1.95c to 2c base, full extras; soft steel bars and bands, 1.85c base, half extras; soft steel angles,

channels and tees, under 3 in., 1.95c; hoops, 2.20c to 2.30c base, full extras.

Sheets.—The demand continues of good proportions, and is divided equally between black and galvanized sheets. Prices are slowly strengthening, another independent mill announcing that it is declining to take on new business except at a figure commensurate with the cost of manufacture and with the selling price of other products. It is extremely doubtful if anything better than $2.25 Pittsburg for No. 28 black, or $3.30 Pittsburg for No. 28 galvanized can be done in this market. With this reservation, we continue to quote the following prices which generally represent the market on small lots, mill shipment, Chicago delivery: Blue annealed sheets, Nos. 9 and 10, 1.81½c; Nos. 11 and 12, 1.86½c; Nos. 13 and 14, 1.91½c; Nos. 15 and 16, 2.01½c. On box annealed, one pass, cold rolled, we quote: Nos. 18 and 20, 2.21½c; Nos. 22 and 24, 2.26½c; Nos. 25 and 26, 2.31c½; No. 27, 2.36½c; No. 28, 2.46½c; No. 29, 2.56½c. We quote on lots from warehouse stocks, as follows: No. 10, 2.15c to 2.20c; No. 12, 2.20c to 2.25c; No. 14, 2.25c to 2.30c; No. 16, 2.35c to 2.40c; Nos. 18 and 20, 2.50c to 2.55c; Nos. 22 and 24, 2.55c to 2.60c; No. 26, 2.60c to 2.70c; No. 27, 2.75c to 2.80c; No. 28, 2.85c to 2.90c; No. 29, 3c to 3.05c. Galvanized sheets, mill shipments, Chicago delivery, are quoted as follows: Nos. 12 and 14, 2.41½c; No. 16, 2.56½c; Nos. 18 and 20, 2.71½c; Nos. 22 and 24, 2.86½c; No. 26, 3.06½c; No. 27, 3.26½c; No. 28, 3.46½c; No. 29, 3.71½c. Jobbers' prices on small lots from store are as follows: Nos. 10 to 14, inclusive, 3.10c; No. 16, 3c; Nos. 18 and 20, 3.10c; Nos. 22 and 24, 3.25c; No. 26, 3.50c; No. 27, 3.70c; No. 28, 3.95c; No. 29, 4.40c; No. 30, 4.85c.

Structural Steel.—About 5,000 tons of new business was added to local mill books during the week under review. Specifications are to full requirements of contracts and tax the capacity of mills. Prices are without change. We quote carload lots, mill shipments, Chicago delivery, as follows: Beams and channels, 3 to 15 in., inclusive, 1.86½c; angles, 3 to 6 in., ¼ in. and heavier, 1.86½c; angles larger than 6 in. on one or both legs, 1.96½c; beams larger than 15 in., 1.96½c; zees, 3 in. and over, 1.86½c; tees, 3 in. and over, 1.91½c; with the usual extras for cutting to exact lengths, punching, coping, bending or other shop work. We quote prices from store as follows: Angles, 2.25c to 2.35c; beams and channels, base sizes, 2.25c to 2.75c; tees and zees, 2.30c to 2.35c. These prices are for either random lengths or cut to specifications in excess of 5 ft.

Plates.—No developments of interest have occurred during the week. New tonnage is light, though specifications are very heavy. The meeting of the association last week did not result in any advance, and we continue to quote as follows: For mill shipments, Chicago delivery, tank steel ¼ in. and heavier, up to 100 in. wide, 1.76½c base; flange steel, 1.86½c base; marine steel, 1.96½c base, all full extras. Plates, 3-16 in. thick, $2 extra; gauges 7 to 8, $3 extra; No. 9, $5 extra. Less than carload lots, $5 extra. Jobbers report a good movement from local stocks with store prices firm. We quote on small lots as follows: Tank steel, ¼ in. and heavier, up to and including 72 in. wide, 2c to 2.10c; over 72 in. wide up to 100 in., 2.10c to 2.20c; over 100 in. wide, usual mill extras, 3-16 in. up to but not including 72 in. wide, 2.10c; 3-16 in., 72 in. wide, 2.35c; flange steel, 25c extra; heads, 25c extra.

Rails and Track Supplies.—Contracting for standard sections is confined largely to electrical and interurban roads, who are buying liberally from a fear that deliveries may be impossible later on. Light rails and track supplies are moving freely, the local interest being sold ahead on both products for two months or more. Prices are firm but without change. We quote heavy sections in 500-ton lots, f. o. b. mill, $28; less than 500 tons to carload lots, $30; less than carload lots, $32. Light rails, f. o. b. Milwaukee mill: 12-lb. sections, $30; 16-lb., $29; 20-lb., $28; 25-lb., $27; 30, 35, 40 and 45-lb. sections, $25.50. Track supplies, f. o. b. Joliet, are as follows: Angle bars, 1.50c to 1.75c, according to tonnage; spikes, first quality, 1.85c to 1.95c; track bolts, 3¼ x ¾, with square nuts, 2.40c to 2.50c per lb., with hexagon nuts, 2.25c to 2.65c.

Merchant Steel.—The leading sellers continue out of the market and new business is limited to the supply that can be secured from jobbers. Specifications are very heavy and of an insistent nature, many concerns being seriously handicapped by their inability to get quicker shipments. Prices are without change but firm. We quote carload lots, mill shipments, Chicago delivery, as follows: Spring steel, 2.10c; sleigh shoe, flat sizes, 1.71½c; concave and convex, 1.86½c; cutter shoe, 2.35c to 2.40c; smooth finished machinery steel, 1.91½c; smooth finished tire, 1.86½c; plow steel, 2.20c and upward, according to quality; toe calk steel, 2.21½c; railway spring, 1.86½c. Cold rolled shafting, 52½ percent off to dealers, 50 percent off in carload lots, and 45 percent in less than carload lots. Crucible tool steel, 6½c to 8c; special grades of tool steel, 13c and up.

Cast Iron Pipe.—The only transaction of interest was the contract let last week by the city of Portland, Ore., for 4,200 tons of pipe, which went to the Oregon Iron & Steel Co. in that city. Routine trade is of fair volume. Prices are firm. We quote carload lots, f. o. b. Chicago: 4-in. water pipe, $30; 6, 8, 10 and 12-in., $29; larger sizes, $28.50; gas pipe, $1 extra.

Merchant Pipe.—No change is noted in the local situation. Though this season of the year is usually a dull one for sellers of pipe, the warm weather that has prevailed, permitting the continuance of building operations and other outdoor work, has resulted in an active movement from warehouse stocks. The withdrawal from the market of several independent makers has greatly strengthened prices and card rates are more uniformly adhered to than heretofore. Mill discounts are given in our Pittsburg report: Chicago jobbers are quoting 76½ to 77 percent on ¾ to 6-in. black steel pipe.

Boiler Tubes.—The week's business was of good volume. Specifications are heavy, many interests anticipating their requirements. Some weakness has developed in jobbers' prices, but mill quotations are firm and without change. We quote carload lots, Chicago delivery, as follows:

BOILER TUBES.

	Steel.	Iron.	Seamless.
1 to 1⅝ inches	40.35	37.35	53.00
1¾ to 2¼ inches	54.35	39.35	40.00
2½ inches	56.35	44.35	43.00
2¾ to 5 inches	62.35	51.35	
		Up to 4½ inches	50.50
6 to 13 inches	62.35	37.35	

Less than carload lots from store, as follows:

	Steel.	Iron.	Seamless Steel.
1 to 1⅝ inches, inclusive	40	35	42½
1¾ to 2¼ inches, inclusive	50	35	35
2½ inches, inclusive	52½	35	30
2¾ to 5 inches, inclusive	60	47½	42½

Wire Products.—The demand for nails, smooth and barb wire, etc., is unusually heavy for this time of the year. The tremendous crops in all sections of the country have placed the farmer in a highly prosperous condition, and the consumption next winter and spring is expected to exceed that of several years past for the same period. Independent makers, as well as the leading producer, are all hard pressed to keep pace with their speci-

fications, especially for smooth wire and wire nails. Prices are without change. We quote carload lots, mill shipments, to jobbers, as follows: Wire nails, $1.95; painted barb wire, $2.10; galvanized barb wire, $2.40; smooth annealed wire, $1.80; smooth galvanized wire, $2.10; polished staples, $2.10; galvanized staples, $2.35. Carload lots to retailers, 5 cents higher than above prices for carloads, and less than carload lots, 10 cents higher.

Coke.—There is a brisk demand for coke and prices are growing stronger. Western foundrymen, however, are averse to contracting ahead because of the difficulty experienced every winter in getting shipments. The tendency is to buy in the open market, which presents many opportunities of buying low-priced coke when demurrage charges are piling up. Both Connellsville and Wise County foundry cokes are firm at $3.25 to $3.50 ovens and furnace coke from $2.50 to $2.75.

Old Material.—The market has received a temporary set-back by the bearish attitude of a few local dealers and consumers, who are short on supplies. It is generally agreed that scrap has advanced altogether too rapidly in the last few weeks, but it is not expected the efforts of these interests will materially change the situation. Railroads have the key to the market, and the hope of getting still higher prices has induced some to withhold their lists until their views in this respect were met. A number of small lists were disposed of last week, but the aggregate tonnage was not large. This week there are three lists being figured on; the Wabash for 600 tons; the C. & E. I. for 500 tons, and the Burlington list for 4,000 tons. The free bidding on all the items in each, is certain indication that they will be moved at top notch prices. Our quotations are without change. For gross tons they are as follows:

Old steel rails (4 feet and over)	$16.00 to 16.50
Old steel rails (less than 4 feet)	15.50 to 16.00
Old iron rails	22.00 to 22.50
Relaying rails, subject to inspection	26.00 to 27.00
Heavy melting steel	15.00 to 15.50
Mixed country steel	12.50 to 13.00

We quote as follows net tons:

No. 1 R. R. wrought	17.25 to 17.75
No. 2 R. R. wrought	16.25 to 16.75
Shafting	18.00 to 18.50
Dealers' forge, No. 1	14.50 to 15.00
Wrought pipe and flues	12.50 to 13.00
No. 1 cast, 150 lb. and less	14.00 to 14.50
No. 1 mill	9.00 to 9.50
No. 1 Busheling	12.50 to 13.00
No. 2 Busheling	12.00 to 12.50
Country sheet	8.00 to 8.50
No. 1 boilers, cut	12.00 to 12.50
Boiler punchings	14.50 to 15.00
Iron car axles	23.50 to 24.00
Steel car axles	18.00 to 18.50
Iron axle turnings	11.50 to 12.00
Cast borings	9.00 to 9.50
Mixed borings, etc	9.00 to 9.50
Machine shop turnings	11.00 to 11.55
Railroad malleable	14.00 to 14.50
Agricultural malleable	13.50 to 14.00
Stove plate and light cast scrap	11.50 to 12.00
Old iron splice bars	19.00 to 19.50

CINCINNATI.

Prices have Advanced on Pig Iron, but the Market is Quiet—No Large Deals Pending.

October 24.

Pig Iron.—The market is firmer and quotations for Southern iron are 50 cents per ton higher than a week ago. At the close of last week the Southern iron at $12.50 Birmingham disappeared from the market, and today $13 is the minimum quotation, while sales have been made at $13.50 and even a little higher for special brands. The cast iron pipe makers were in the market again this week and took something like 25,000 tons, mostly Southern iron. This purchase took up a large part of the cheap iron that was being offered. The Southern producers are now mainly asking $13.50 to $14 for No. 2 foundry, Birmingham basis, but there is still some spot iron and a little iron for forward delivery obtainable at $13, and the market may be called strong at $13 to $13.50 with an upward tendency. A sale of 3,000 tons of basic iron on the basis of $16 valley furnace is also reported, which indicates firmness in that grade. Gray forge iron has advanced, and sales of 400 tons at $11.75 and 400 tons at $12 Birmingham are reported. Silvery iron, 8 percent silicon, is now quoted on the basis of $18 to $18.50 at Ohio furnace. Southern charcoal iron is slightly higher. Southern Ohio furnaces are quoting $16 for No. 2 foundry at furnace, but it is believed that in some instances this price can be shaded 25 cents per ton, although sales have been made at full quotation. A canvass of the sales agencies representing Southern furnaces, reveals a strong situation. Two large producers are out of the market, three are holding to $14 for No. 2 foundry, Virginia furnaces have advanced their price to $15.50 furnace, which leaves only a few producers still in the selling list, and most of these are asking $13.50, and while $13 can still be done, it is not easily obtainable. Spot iron continues relatively weaker than iron for forward delivery, and for spot iron in small quantities $13 is being done freely. The market is quieting down so far as inquiries are concerned, and there are now no large orders pending. Consumers are placing small orders in a manner which indicates that they have not fully covered their wants or have underestimated their requirements. We quote f. o. b. Cincinnati as follows:

Southern Foundry No. 1	$16.25 to 16.75
Southern Foundry No. 2	15.75 to 16.25
Southern Foundry No. 3	15.25 to 15.75
Southern Foundry No. 4	14.75 to 15.25
Southern Foundry No. 1, soft	16.25 to 16.75
Southern Foundry No. 2, soft	15.75 to 16.25
Gray Forge	14.50 to 14.75
Northern Foundry No. 1	17.65
Northern Foundry No. 2	17.15
Northern Foundry No. 3	16.65
Jackson County Silvery, 8 percent	19.15 to 19.65
Southern Charcoal	19.00 to 19.25

Finished Material.—The market remains firm with no quotable change in prices. Jobbers are having a good demand, and have difficulty in keeping stock up, as mill deliveries are so far in arrears on some descriptions. Bar iron is quoted at 1.70c to 1.75c; steel cars at 1.63c, half extras, with dealers quoting 1.85c for iron and steel out of store. Galvanized sheets, No. 10 and No. 12, in car lots are 2.48c. We quote black sheets, No. 27, at 2.30c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 2.70c; No. 27, 2.60c; No. 16, 2.20c; No. 14, 2.10c; No. 12, 2.05c; No. 12, 2c. Tank plates are firm and sell out of store at 2c for ¼-in. and 2.10c for 3-16, Nos. 8 and 10. Beams and channels are quoted at 2.25c to 2.50c from stock and angles at 2c to 2.05c for base sizes.

In merchant pipe the market is unchanged. Mill deliveries on iron pipe are becoming slow. Steel pipe is coming with fair promptness. Prices are unchanged and there is still some irregularity in quotations on the part of independent mills, but the schedule is fairly well maintained. We quote:

MERCHANT PIPE.

(Basing Discounts.)

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Guaranteed Wrought Iron Pipe. Black. Percent.	Guaranteed Wrought Iron Pipe. Galv. Percent.
⅛ and ¼ inches	69.7	53.7	67.2	51.2
⅜ and ½ inches	73.7	61.7	71.2	59.2
¾ to 6 inches	77.7	67.7	75.7	65.7
7 to 12 inches	72.7	57.7	70.7	55.2

Coke.—It is becoming difficult to locate coke prices. Many operations have advanced their quotations this week, and some are not quoting at all. Car shortage in some

districts makes prices of no value because of inability to ship. The two important districts, Connellsville and Wise County, Virginia, have put their prices up to $4 on some brands of foundry cokes, and the recent firmness in the market has practically put a stop to contracting. There are only a few belated buyers who have not provided for their wants and inquiry for future delivery is not heavy, but there is a call for prompt shipment coke on the part of consumers who have not been able to get their deliveries. Prices in the various coke-producing districts are as follows:

†Wise County, Va. Furnace Coke prompt shipment.	$2 50	to 2.75	per ton
Wise County, Va. Foundry Coke prompt shipment.	3.75	to 4.00	per ton
Pocahontas Furnace Coke on contracts	....	to	per ton
Pocahontas Foundry Coke on contracts			
Connellsville Furnace Coke prompt shipment	2.75	to 3.00	per ton
Connellsville Foundry Coke prompt shipment	3.75	to 4.00	per ton
Kanawha Furnace Coke on contracts			
Kanawha Foundry Coke on contracts	....	to	per ton

†Wise County, Va., Coke on Furnace contracts is sold mainly on a sliding scale basis for pig iron prices on the following basis: $1.65 per ton on $9.00 pig iron, plus 17 percent of the advance on pig iron above $9.00 Birmingham.

Old Material.—The market is firm and advancing with a good demand. We note changes in prices which are as follows, f. o. b. Cincinnati:

Old No. 1 railroad wrought, net tons	$17.00 to 17.50
Cast machine and foundry, net tons	13.50 to 14.00
Old iron rails, gross tons	22 50 to 23.50
Old steel rails, gross tons	16 00 to 16.50
Old short lengths, gross tons	17.00 to 17.50
Old iron axles, net tons	22 50 to 23.50
Stove plate, net tons	10.00 to 10 50
Wrought turnings, net tons	11.00 to 12.00
Cast borings, net tons	8 50 to 9 00
Car wheels, net tons	16 00 to 16.50

PHILADELPHIA.

Pig Iron Prices Slowly Advancing, but Demand is not Quite as Strong.

October 24

There is a perceptible diminution in the feverish rush to buy pig iron that has marked the last few weeks, but market conditions are no less strong. With many furnaces out of the market and the wants of buyers pretty well covered for the remainder of 1905, both sides recognize the desirability of taking things a little easier and awaiting developments in such matters as possible car shortage, and advances in coke, coal, ore and labor, which cannot fail to make for higher prices. Efforts to keep down prices have been so successful, in view of the enormous demand, that the danger of a runaway market seems materially lessened.

Pig Iron.—Prices are slowly working higher, under the heavy pressure of orders. This tendency has possibly been a little accelerated by accidents which have temporarily closed one or two furnaces, thus slightly reducing production, and by the further fact that some old furnaces which were put out of blast some months ago have not as yet resumed operations and, where supplies of coke and ore were not contracted for at lower figures, cannot now be profitably blown in again. The demand for all grades of iron shows no signs of relaxing, foundry and basic leading in activity. With the prospective advance in freight rates on Nov. 1 Southern irons have been marked up. Prices which show some changes from last week may be quoted as follows:

No. 1X Foundry	$18 00 to 18.50
No. 2X Foundry	17.50 to 18.00
No. 2 Plain	17.00 to 17.75
Standard Gray Forge	16.50 to 17.00
Ordinary Gray Forge	15.75 to 16.25
Basic	17.25 to 17.75
Low Phosphorus	22.00 to 23.00
Southern No. 2X, rail	17.00 to 17.50
Southern No. 2X, dock	16.50 to 17.00

Finished Material.—The enormous orders of the railroads, which threaten to take up the entire productive capacity of many mills for the whole of 1906, are forcing smaller buyers into the market with a great variety of orders, with the material result of higher prices and increasing premiums. The activity is unprecedented in nearly every branch. The quotations that follow are in a large degree nominal. For prompt delivery three cents a pound has been given for beams and angles, though the schedule price is two cents and the current figure 2.5 cents. The figures, however, may be given as unchanged: Beams, channels and angles, according to specifications, 1.83½c to 2.50c; refined iron bars, 1.63½c to 1.80c; steel bars, 1.63½c to 1.83c; plates, 1.73½c to 1.80c.

Old Material.—There has been a decided upward movement in prices during the past week, as the mills have bought much more freely. These figures are quoted:

Old steel rails	$17.00 to 18.00
No. 1 steel scrap	17.25 to 18.00
Old steel axles	21.00 to 21.50
Old iron axles	26.50 to 27.50
Old iron rails	23.00 to 24.00
Old car wheels	16.75 to 17.50
Choice scrap, R. R. No. 1 wrought	22.50 to 23.50
No. 1 yard scrap	19.25 to 20.00
Machinery scrap	16.00 to 16.75
Low phosphorus scrap	21.50 to 22.50
Wrought iron pipe	16.00 to 16.50
No. 1 forge fire scrap	16.00 to 16.50
No. 2 forge fire scrap, ordinary	12.75 to 13.50
Wrought turnings	14.00 to 14.50
Axle turnings, heavy	15.50 to 16.00
Cast borings	10.00 to 10.50
Stove plates	13.00 to 13.50

NEW YORK.

Lull in Buying of Pig Iron—Heavy Inquiries for Basic Pending.

OFFICE OF *The Iron Trade Review*,
ROOM 1315, No. 150 NASSAU ST., October 24.

Pig Iron.—The foundry iron market has experienced a lull during the past week, a lull which is, however, without particular significance. The consuming demand has been as heavy as ever and prices have continued to stiffen. Anxiety for the immediate future has been relieved among consumers as well as among producers, and everybody appears to be satisfied except the selling agents who constitute the only inactive element in the trade. The car famine, which is becoming apparent in different parts of the country, is beginning to trouble foundry iron circles, some producers finding difficulty in securing prompt shipment over accustomed lines. The total sales of the week have not been more than one-third of the amounts reported during the week preceding. Inquiry is, however, active, one of the most important tenders of the week being several lots of various grades and special analysis pig irons issued by the General Electric Co. for delivery at Schenectady and Lynn. The total makes up an aggregate of nearly 12,000 tons, and includes two lots of 3,000 tons each, and one each of 2,800, 450, 1,750 and 750 tons. The most interesting feature of the entire market has been the activity in basic iron, inquiries for fully 50,000 tons having come into this city and Philadelphia. Of this total only some 6,000 tons have been accounted for in the local selling field, but as the ideas of the consumers were very little below those of the producer—$17 at the furnace—it is reasonable to assume that the greater portion has been placed. Prices for basic iron are proceeding upward more rapidly than those of the foundry grades, the total gain since the upward movement began being no less than $2 per ton. Two sales of Virginia basic were effected on the basis of $16 and $16.50 at the furnace. The following are prices at tidewater:

Northern No. 1 Foundry	$17.50 to 18.25
No. 2 Foundry	17.00 to 17.75
No. 2 Plain	16.50 to 17.00
No. 1 Southern Foundry	17.00 to 17.75
No. 2 Southern Foundry	16.50 to 17.50
No. 3 Southern Foundry	16.25 to 16.75
No. 4 Foundry	15.50 to 15.75

Pig Iron Certificates.—Trading in pig iron certificates on the New York Produce Exchange has been more active

during some weeks past, fully 1,200 tons having been disposed of. Sales have been somewhat hampered by the character of the material in stock, most of the metal in the yards being low grade. Prices have stiffened materially. Foundry iron warrants follow:

	Bid.	Asked.
October	15.75	16.25
November	15.80	16.35
December	16.00	16.40
February	16.25	....

Finished Iron and Steel.—While the railroads continue to be the largest purchasers of steel products, still business is not confined to this quarter. It is estimated that orders for fully 60,000 tons of structural material for buildings in this city are to be placed within the next 30 days. There is an enormous demand for structural steel in small lots ranging from 25 to 150 tons each. These mostly represent work to be done before winter, and those interested are willing to pay almost any sort of premiums for prompt delivery. Milliken Bros., Inc., have secured a contract for 1,500 tons for the construction of the Denechaud hotel, New Orleans, La. Plates are in good demand, but premiums are not as yet the rule in the East, although for small lots bonuses are frequently offered and accepted. An inquiry which is interesting local platemen is one from Manila for 2,700 tons of plate to be used in the construction of 10½ miles of 42-in. pipe for the Philippine Government.

The following are prices at tidewater: Angles, 3 to 6 in. x ¼ in. and heavier, 1.84½c; beams, 3 to 15 in., 1.84½c; tees, 3 x ¼ in. and heavier, 1.89½c; plates, carloads, tank, 1.74½c; flange, 1.84½c; marine and ordinary fire box, 1.94½c; refined iron bars, 1.60c; soft steel bars, 1.64½c to 1.79c; sheets in carload lots, New York, No. 28, black, 2.40c.

Old Materials.—The market for all classes of scrap material has been quiet but strong, old steel rails, heavy steel, and low phosphorus steel scrap being perhaps in most active demand. Cast scrap of all descriptions is also receiving more attention, which is no doubt due to the activity in pig iron. The following prices are f. o. b. approximately, at tidewater:

Old iron rails	$20.00 to 21.00
Old steel rails, long lengths	15.00 to 15.50
Old steel rails, short pieces	14.50 to 15.00
Relaying rails	22.50 to 23.00
Old car wheels	16.00 to 16.50
Old iron car axles	21.00 to 22.00
Old steel car axles	18.50 to 19.00
Heavy melting steel scrap	15.00 to 15.50
No. 1 railroad wrought scrap	18.00 to 19.00
Iron track scrap	17.50 to 18.00
Wrought pipe	12.00 to 13.00
Cast borings	10.00 to 10.25
Wrought turnings	14.50 to 15.50

BIRMINGHAM.

Higher Prices Asked for Pig Iron—Large Output Expected at the Ensley Steel Plant.

BIRMINGHAM, ALA., Oct. 23.—Alabama pig iron manufacturers are asking from $13.50 to $14 per ton, No. 2 foundry, for their iron, and it is announced that some sales are being made at the last named figure, early delivery stipulated. The furnaces in this district are well sold ahead and are finding some trouble in making deliveries on the orders on account of a little railroad car shortage and scarcity of common labor with which to load the product. There is still a little inquiry for iron, delivery this year, while considerable inquiry is being received for iron to be delivered during the first half of the coming year. Only a small portion of the business being offered is being accepted. Some of the larger companies which announced a few weeks since that they were out of the market entirely, are still practically out of the market for business up to May 1, except with regular customers in need of small lots.

There is more trouble being experienced in getting railroad cars with which to make deliveries of iron in the neighborhood of Florence and Sheffield, in the northwestern part of Alabama, than around Birmingham proper.

There is decided improvement in the coal and coke supplies in this district, and it is believed before the end of November the coal situation will show up better than it has been at any time since the union miners' strike began in July, 1904. The coke situation is better, according to reports.

The following quotations are given: No. 1 foundry, $14; No. 2 foundry, $13.50 to $14; No. 3 foundry, $12.50 to $13; No. 4 foundry, $12 to $12.50; gray forge, $11.50 to $12; No. 1, soft, 14; No. 2, soft, $13.50 to $14.

The expectations are for the largest output at the Ensley steel plant (Tennessee Coal, Iron & Railroad Co.) during this month ever enjoyed during any one month since the plant has been in operation. The daily production has been increasing as new equipment has been installed. The steel demand is strong, especially for rails.

CLEVELAND.

Strong Interests Take Decided Stand on Ore Prices—Opposed to Big Advance.

OFFICE OF *The Iron Trade Review*,
BROWNING BUILDING, October 25.

Iron Ore.—Representatives of two of the largest ore interests in this city have expressed themselves as decidedly opposed to advancing the price of ore for 1906 more than 25 cents per ton. They say that the fact that coke is already being quoted at prices which many buyers consider unreasonable does not justify the ore interests in taking similar action, but that on the contrary there is grave danger that if ore were to be advanced 50 cents or more, as some interests have proposed, the result would be disastrous, because such action would force the price of pig iron to a point which would be certain to check consumption and greatly mar the prosperity which might otherwise continue indefinitely. The interests which have taken a decided stand on this question are generally ranked among the producers, but both also have connections with manufacturing, and feel that they are in a position to consider the subject from the standpoint of the maker of pig iron, as well as from that of the miner and seller of ore. Present indications are that this conservative influence will prevail. The experience of 1900 is recalled to show the importance of quoting conservatively at this time. In 1899 ore was selling on a basis of $2.95 per ton for old range Bessemer, but on account of the rapid advance of prices of finished products during that year, ore producers felt that they were entitled to higher prices and the base price for 1900 was fixed at $5.50. The result was disastrous, as many who bought were unable to take the ore and the ore sellers were in as unhappy a condition in 1900 as in the previous year. One large ore seller said today that he did not intend to help again to kill the goose that lays the golden egg. "We are getting a good price now," he said, "and if we quote 25 cents higher for 1906, that will be all that we have any right to ask and all that the market will justify."

Pig Iron.—Nearly all the foundrymen of Cleveland are well supplied with iron for the remainder of the current year, but those who need some additional tonnage are finding it difficult to buy except at high prices. Quotations at Buffalo have advanced to such an extent that shipments from that city are no longer being made to Cleveland, and $16 is the lowest quotation obtainable in the valley for No. 2 foundry. Indeed, there is little iron to be had at that price—some sellers demanding as high as $16.50.

On Bessemer $16, valley, is the minimum, and basic cannot be had at less than $15.75; while some interests are asking $16.25. Very little Southern iron is being sold in this market. The usual quotation is $13, Birmingham, or $16.85, Cleveland. We quote as follows, Cleveland delivery:

Bessemer	$16.85 to 17.35
No. 1 Foundry	17.50 to 18.00
No. 2 Foundry	16.85 to 17.00
No. 3 Foundry	15.85 to 16.00
No. 2 Southern	16.85 to 17.35
Gray Forge	15.50 to 16.00
Gray Forge, Southern	15.25 to 15.75
Lake Superior charcoal	17.50 to 18.00

Coke.—The coke market is in a feverish condition. It is impossible to quote accurately prices for prompt shipment, as very little coke is to be obtained, and prices are made according to individual cases. For the first half of next year $3 is the minimum for Connellsville furnace coke, while $3.50 is asked for foundry coke. In some cases lower quotations are made for the second half on an effort to induce buyers to contract for the entire year.

Finished Material.—Business in finished material runs along in the even tenor of its way; the market being strong on nearly all products. Bar iron is showing additional strength; 1.75c at the Cleveland or Youngstown mills now being the usual quotation, while on very desirable business, 1.70c can still be done. Consumers of steel bars are specifying more liberally. Some whose contracts expire on Jan. 1 are asking for extensions, but their requests are often refused unless the specifying has been satisfactory to the seller.

Old Material.—Heavy dealing with advanced prices, especially in the heavier grades, marked the past week. Large quantities are being stored in anticipation of still higher prices. We quote Cleveland delivery as follows:

Old iron rails	$22.50 to 23.50
Old steel rails (over 6 feet)	16.00 to 17.00
Old steel rails (under 6 feet)	17.00 to 18.00
Old car wheels	16.00 to 16.50
Steel boiler plate	13.50 to 14.50
Steel axles	19.50 to 20.50
Malleable iron (railroad)	16.00 to 17.00
Malleable iron (agricultural)	15.00 to 16.00
Heavy steel	16.50 to 16.75

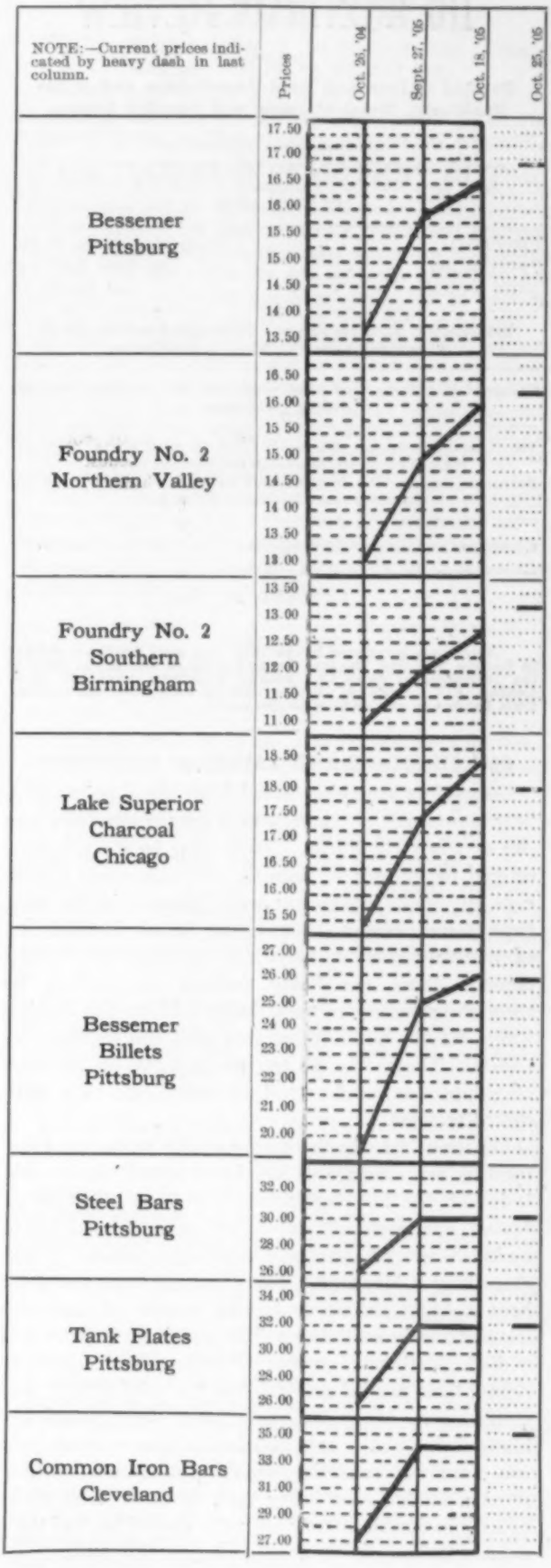
We quote as follows, net tons:

No. 1 R. R. wrought	17.50 to 18.00
No. 1 busheling	14.00 to 15.00
No. 1 machine cast	13.75 to 14.25
Iron axles	22.50 to 23.50
Axle turnings	11.50 to 12.50
Wrought turnings (free from cast)	11.00 to 12.00
Grate bars	9.00 to 9.50
Pipes and flues	13.00 to 14.00
Tank iron	11.00 to 11.50
Hoop and band iron	8.00 to 9.00
Sheet iron	7.00 to 8.00
Wrought drillings	11.00 to 12.00
Stove plate	10.50 to 11.00
Cast borings	8.50 to 9.50

Structural Workers' Strike.—At the headquarters of the International Association of Structural Iron & Bridge Workers it is stated that negotiations for the settlement of the structural strike declared against the American Bridge Co. are off for the present. A conference was recently held in an effort at ending the difficulty, but no agreement was reached. The bridge company, while agreeing to sublet no contract to any concerns not employing union labor, declined to comply with the association's demand that all erection work being done by the Steel Corporation, of which the bridge company is a subsidiary, be by union men. Secretary McNamara, of the association, reports that additional contracts have been tied up during the past week and that this policy will be extended.

Will Meet in Cleveland.—The next annual meeting of the National Metal Trades Association will be held in Cleveland in March. This decision was reached by the administrative council of the association at a meeting in Cincinnati last week. About 300 manufacturers will be in attendance.

PRICE CHART.



THE IRON TRADE REVIEW

Devoted to Iron and Steel Manufacture and to the Machinery, Metal-Working and Foundry Trades.

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OCTOBER 26, 1905

Americans interested in the iron and steel business, visiting in Europe, will find The Iron Trade Review on sale at the office of the International News Co., Breams Buildings, Chancery Lane, London, E. C., England. Copies will be forwarded on request, from London to any address in the world.

CAR SHORTAGE AND RAILROAD EQUIPMENT.

Complaints are being heard from many points of a "car shortage." A car shortage may result from any one of many conditions. There may be more freight offered for movement than the railroads could handle even though all equipment were operated in the most expeditious manner. There may be an insufficiency of motive power to move the existing cars, either through there not being enough locomotives, or through too many of them being laid up for repairs. There may be an inadequacy of yard and terminal facilities. There may be too much delay on the part of shippers in loading and unloading the cars committed to them.

Whatever may be the nature of the present and impending car shortage, it is evident at first glance that it is not due to congestion. The great shortage of 1902-3 was obviously due in the greatest measure to an insufficiency of yard and terminal facilities. It was essentially a blockade. There may or may not have been a slight deficiency in the number of cars and locomotives in existence,—it is certain that there was a disproportionate number of locomotives unable to render their normal service—but the chief trouble was congestion. Many railroad yards were practically blockaded, and the cars and locomotives ostensibly in use were not rendering anything like their normal service, loaded cars being two, three or four times as long in transit as they normally should be, and their actual efficiency being reduced in just this ratio.

There is no trouble of this nature at the present time. Railroad yards have been greatly enlarged in the past three years, and better methods have been instituted for handling the rolling stock. On this point the railroads have done enough to deserve praise and not blame.

In the matter of equipment there has been great improvement. Reports show for the year 1902, 1,503,949 freight cars, and for the year 1904, 1,592,194 freight cars, an increase in number of just 12½ percent. Locomotives in the same period show an increase from 41,626 to 46,743, an increase also of almost exactly 12½ percent. Considering that the intervening period has been largely one of doubt and uncertainty, the increase shown is a very good one. There are no statistics as to average capacity, but it is certain that inasmuch as old equipment has been abandoned, and the new equipment bought has been of the highest capacity, as to both cars and locomotives, the actual capacity has been increased in considerably greater ratio than has the number.

The tonnage carried by the railroads has increased at a wonderful rate, and it should not be particularly surprising if there should be times when the railroads find themselves with inadequate facilities. The latest year for which complete ton-mile statistics are available is 1903, and in that year the ton-miles of freight carried was 171,290,310,685. This was a year of comparative quiet in the iron trade, while 1902, a year of great activity, showed a ton mileage of only 156,624,166,024. In 1890, the ton mileage was less than half what it was in 1903, being 79,192,985,125. The railroads did not do so badly to more than double their efficiency in 13 years. To do this they increased the number of freight cars by 53 percent and the number of locomotives by 38 percent, the balance of the increased efficiency being made up by increased individual capacity and better handling.

Complaint is made by the railroads that at this time some of the very shippers who are complaining of lack of cars are themselves holding their incoming loaded cars for several days, and paying the demurrage on them, whereas if they were more expeditious in their own work the railroads would be able to do better. Undoubtedly this is true, but it is quite certain that it is through no ordinary carelessness that cars are thus held. Demurrage bills are a dead loss, and are not lightly incurred.

In one respect the railroads are censurable. The criticism has often been made, but will bear indefinite repetition, that the railroads are too prone to make their large improvements when everything is prosperous, materials are costly, and deliveries are hard to get, while at other times they are niggardly in their expenditures. The present intense activity in the iron trade is due almost wholly to heavy railroad buying. It is claimed on behalf of the railroads that the cry of a car shortage is perennial; that the railroads cannot hold themselves ready to respond instantly to

the sudden fluctuations in the demand for freight movement. If the railroad business is so ponderous, why should not a more steady and regular spirit be shown in the making of improvements? If the railroads cannot respond to, or be governed by, the variations in demand for freight movement, why should they, as apparently seems to be the case, be governed by the much more fickle influence of changing sentiment in the financial world?

THE FUTURE OF THE REPUBLIC COMPANY.

The meetings of stockholders and directors of the Republic Iron & Steel Co. last week promise results of vast importance to that company. Although some changes in the personnel of the organization, including the election of a new president and chairman of the executive committee, have been made, it is expected that there will be even a greater change in the policy than is indicated by the election of new officers.

Until comparatively recently, the ownership of stock of the company has been widely distributed, and the members of the executive committee did not really represent any united interest. The new committee will be thoroughly representative of the controlling interest and will carry out the plans and policies of the small number of stockholders who own a large majority of the stock. An erroneous impression that one man is in control has been caused by newspaper reports. The truth is that while Mr. Gates is a heavy stockholder, others have much larger holdings. Mr. Gates often has been active in speculative affairs, but those who know him best say that no man understands a genuine business proposition more thoroughly than he does, or is more sane and conservative than he in the management of a great property. Associated with him are a number of men—some of whom are on the new committee, and some of whom are not publicly known as actively interested in the company—who have the very highest reputations in the business world, their names being synonymous with integrity and sound conservatism, while, at the same time, they have the courage and ability to build up a great industrial concern. Under conditions of the past the responsibility has rested largely with a few officers, and they have accomplished much toward making the Republic company more powerful; but it is confidently believed by those who are in a position to know that, under the more definite plan of the management which has just been inaugurated, far greater results will be attained.

No Purchase By Steel Corporation.

(Special Telegram.)

Pittsburg, Oct. 25.—There is no truth in the report that the Steel Corporation has bought 80,000 tons of Bessemer pig iron for November delivery at $16, valley, and has optioned 100,000 tons for later delivery at $16.50. The corporation will presumably buy more iron from time to time, but has not made any further purchases since 40,000 tons was taken at $15.50 and $16 for October and November.

NEW TOLEDO FURNACE

Will be Erected with a By-product Coke Plant—Original Plan to be Carried Out.

Another large furnace is to be added to the chain of iron-making plants which line the great lakes. The Toledo Furnace Co. announces that it will soon begin the construction of a furnace similar to that now in operation at Toledo, and in addition will erect a complete by-product coke plant. The new furnace will be on the same site and will be practically a duplication of the present furnace, which was completed in May, 1903; in fact its construction will be but a completion of plans laid at the time the first stack was erected. It will be possible to utilize the elaborate system now in force for the handling of ore, slag and pig iron and considerable of the other equipment will be ample for the needs of both stacks. The new furnace will be located just east of the present furnace on the large tract of Maumee river lowlands, owned by the company and reached by the largest lake craft. The original furnace, which is to be practically duplicated, has a stack 80 x 20 ft. with four Kennedy stoves; its annual capacity is 130,000 tons of various grades of iron.

The by-product coke plant will have a capacity of slightly more than 400 tons daily. The work of construction will be under way in the near future and will require perhaps a year for completion. The Toledo Furnace Co. is an interest of Pickands, Mather & Co., Cleveland.

OBITUARY.

Nathaniel P. Hobart, until recently connected with the American Brake Shoe & Foundry Co., died at East Orange, N. J., Oct. 13, at the age of 58.

Arthur G. Brigham, at one time engaged with his father in the steel business at Boston, died Oct. 11, at Jamaica Plain, Mass. He was 41 years of age.

Edward Wright, for many years in the iron and steel business at Nashua, N. H., died Oct. 18, at the age of 78. He is survived by his widow, two sons and two daughters.

Frederick Grinnell, an inventor of national reputation, died in New Bedford, Mass., on Oct. 22. For many years he had been engaged in the manufacture of locomotives and was president of a fire extinguisher company of Providence, R. I.

Wilbur F. Studebaker, until 10 years ago manager of the Chicago branch of the well-known carriage manufacturing firm, died Oct. 14 at his apartments in the Ansonia Hotel, New York. He retired from active business some time ago.

John J. Pallas, president of the Park Board of New York, died Oct. 16 of heart failure. He started life as a breaker boy in the Pennsylvania coal mines and later became a patternmaker. In this connection he became interested in the labor question and was at one time president of the Central Federated Union and of the New York State Section of the Workingmen's Federation.

Sir Edward Hamer Carbutt died at his home at Cranleigh, near Guilford, Surrey, Eng., Oct. 8, in his 67th year. At the age of 23 he became connected with the firm of Thwaites & Carbutt, of Leeds, makers of steam hammers and all kinds of iron and steel works machinery. In 1877 he retired to devote his life to the public service. He was the representative of the Institution of Mechanical Engineers in the National Physical Laboratory, a member of the departmental committee of the Royal College of Science and School of Mines, a past president of the Institution of Mechanical Engineers, a member of the Institution of Civil Engineers and a vice president and one of the charter members of the Iron and Steel Institute, at the recent meeting of which he took an active part.

NEW MEN, NEW POLICY IN REPUBLIC COMPANY.

EXECUTIVE OFFICES WILL BE TRANSFERRED FROM CHICAGO TO NEW YORK.

New Committee Will Take Active Part in Management—Operating and Sales Offices not to be Moved.

At the meeting of the directors of the Republic Iron & Steel Co., held at the New York office of the company, Oct. 19, S. G. Cooper, of Pittsburg, was elected president to succeed Alexis W. Thompson, whose retirement from the presidency had been rumored for a long time. Charles S. Guthrie was chosen chairman of the board in place of Col. G. Watson French. With these exceptions all the old officers were re-elected. The election of Mr. Cooper came as a complete surprise to the trade. Dennis C. Merriam, of Chicago, assistant general sales agent of the American Steel & Wire Co., was offered the presidency on Wednesday of last week. He attended the meeting of the directors, but declined to accept, as he felt he could not give the subject proper consideration in the short time allowed. The offer to Mr. Merriam was made after the failure of the negotiations with Mr. Frank Baackes, general sales agent of the American Steel & Wire Co.

The New Executive Committee.

Mr. Guthrie, President Cooper, Grant B. Schley, L. C. Hanna and John W. Gates were named as an executive committee. This committee is new, none of the former members having been renamed. The matter of providing for the accumulated dividends on the preferred stock was referred to the executive committee, which is to report to the full board at a later meeting. The financial statement of the company has been prepared and will be made public as soon as it has been approved by the executive committee.

The executive offices will be removed from Chicago to New York and the executive committee will be much more active than heretofore in the management of the affairs of the company. The offices of the operating department will not be moved from Chicago to Youngstown, as has been contemplated; at least, not at any time in the near future. Chairman Guthrie will make his headquarters in New York, but President Cooper will still spend much of his time in Pittsburg, as he will not sever his connection with the firm of Banning, Cooper & Co.

Vice Presidents A. N. Houston, G. Watson French, George A. Baird and J. F. Taylor were re-elected, and Chas. Hart, general manager of the Youngstown works of the company, was also elected a vice president. The new management is anxious to have Mr. Baird continue as general sales agent, and it is expected that he will be able to so arrange other engagements as to serve the Republic in that position. Mr. Baird's ability and personality have had much to do with the upbuilding of the interests of this corporation. He has been identified with the Republic Iron & Steel Co. since its organization, and with the iron and steel business all his working life. He entered the employ of P. L. Kimberly & Co., at Sharon, Pa., in 1881, as office boy. In 1894 he was made assistant secretary and treasurer of the Atlantic Iron & Steel Co., one of the interests of the late P. L. Kimberly, and four years later was appointed manager of the Sharon Iron Co., Ltd., and of the Buhl Steel Co., both of Sharon, Pa. When these interests were absorbed by the Republic Iron & Steel Co., Mr. Baird was elected general sales agent. This position he has retained throughout his connection with the company, having also been elected vice president and director in the interim.

Developments at the meeting of the directors serve to remove the uncertainty which has existed in regard to the identity of the controlling interests in the property. It was stated definitely that the control of the company is lodged in the hands of a group of men, including E. J. Berwind, Charles S. Guthrie, Grant B. Schley and several others, including John W. Gates, Mr. Gates being, however, in no sense in individual control of the company. His interest is said to be no larger than that of other members of the group which has taken over the direction of the company's affairs.

At the board meeting W. H. Hassinger, who had been omitted from the list of directors at the election held on Wednesday in Jersey City, was re-elected a director. In order to make room for him, Charles H. Wacker offered his resignation. It had been expected by some that Mr. Thompson would resign his directorship, but the fact that he did not do so made necessary the temporary withdrawal of Mr. Hassinger, for whom a place was made later by the resignation of Mr. Wacker.

President Samuel G. Cooper.

The newly-elected president is a native of Chicago, and commenced his career in the iron and steel business with the Illinois Steel Co. For years he was the traffic manager of that company and was known as one of the most efficient men in that capacity in the country. Going to Pittsburg in 1892, he became identified with Naylor & Co., in a similar capacity, but later developed into one of their best salesmen. In 1899 Mr. Banning, also of Naylor & Co., and Mr. Cooper formed the partnership of Banning, Cooper & Co. Ltd., of which Mr. Cooper is now the head.

Mr. Cooper returned to Pittsburg on Saturday morning and found his desk heavily laden with letters and telegrams expressing the congratulations of his friends on his election. Mr. Cooper said that his election was as much a surprise to him as to any one.

Chairman Charles S. Guthrie.

Charles S. Guthrie first came into special prominence in the iron and steel industry when in 1899 he was the moving spirit in the formation of the American Steel Hoop Co., under the Moores. Previous to that time he was head of the Pittsburg offices of Naylor & Co., New York iron and steel merchants, and when the Pittsburg representatives of that firm organized the company of Banning, Cooper & Co., he was one of those most heavily interested. When the American Steel Hoop Co. was organized, he was its first president and remained in that position until, on the formation of the Steel Corporation, his company and the National Steel Co. were absorbed by the Carnegie Steel Co. Since his retirement he has traveled much and has not occupied an active official position. For years he has been rated as a close friend of John W. Gates.

Retirement of Chairman French.

G. Watson French, who has retired from the chairmanship of the executive committee, is another official who has been connected with the Republic Iron and Steel Co. since its organization. Mr. French was formerly president of the Sylvan Steel Works, Moline, Ill., which was absorbed by the Republic organization in 1899. His home is in Davenport, Iowa, where he has large interests, being president of the Eagle Mfg. Co., as well as of the Bettendorf Metal Wheel Co. of that city.

Progress of the Republic Company.

Much regret is felt at the retirement of Mr. Thompson, whose executive ability and sterling qualities as an organ-

izer and creator are of a high order and widely recognized. His administration has been a notably clean one, his sole purpose having been to develop to their highest productiveness the company's various properties. No entangling alliances with Wall street have marred his record; and for his singleness of purpose in this respect universal commendation is accorded him. Mr. Thompson has been identified with the Republic Iron & Steel Co. since its organization in May, 1899, having been vice president for the first two years, and president for the last four years; and its marvelous growth from "a lot of iron rolling mills —an aggregation of antiquities and a conglomeration of calamities," as it was facetiously described by some one at the time the company was organized, to its present high position in the ranks of the independent producers, is a sufficient testimonial to his untiring energy and ability. When the mills in the Mahoning and Shenango valleys were acquired, the company also secured four blast furnaces of modest pretensions, together with a moderate tonnage of ore in the Lake Superior district, including the Cambria and Lillie mines. These furnaces have since been rebuilt and their capacity increased. Extensive additions have also been made to the company's ore properties in the North. The most desirable adjunct of the company, however, at the time of its organization was the Southern interest, consisting of two blast furnaces and extensive undeveloped coal and iron ore lands belonging to the Pioneer Mining & Mfg. Co., of Birmingham, Ala. Under Mr. Thompson's able administration, these furnaces have been entirely remodeled and their capacity increased, as well as an additional stack added; new ore mines opened up and made producers, and the coal properties likewise developed. The largest individual coking plant in the United States, consisting of 1,100 ovens, with a daily output of 2,200 tons, has also been built at Birmingham, making the company absolutely independent in this region for its supply of raw products. The same far-seeing judgment has been shown in connection with its Northern properties. In 1899, the Republic Iron & Steel Co. did not produce a pound of steel, but today it has one of the finest Bessemer steel plants in the United States, with an annual output of 500,000 tons. It has this year finished and put in successful operation at Youngstown a modern steel rail mill and sheet bar mill. Five continuous rolling mills have also been added in the years previous, and in many other ways have the company's properties been improved and brought up to date. In addition, there has been acquired a very large acreage of coking and steam coal properties in the Connellsville region. The former are now being opened up, and the company expects by June 1 next to be manufacturing its own coke for use in its various Northern blast furnaces. The improvements at present under way at Youngstown, O., include the erection of a new furnace at the Hazelton plant, together with the construction of a hot metal railroad to connect these furnaces with the Bessemer plant at Youngstown. The completion of this undertaking will not only decrease the cost of production, but will also greatly increase the capacity of the Bessemer steel plant. Thus, from an aggregation of antiquities, the various plants have been welded into a homogeneous whole, the company's products broadened and itself made absolutely independent of all outside influences for its supply of raw materials. This is but a brief resume of what has been accomplished under the management of Mr. Thompson and no further comment is needed to point to his successful administration.

Mr. Thompson's first experience with the iron and steel business began in the early 70's, when he entered the employ of Samuel Kimberly, father of P. L. Kimberly, at the blast furnaces owned by him at Wheatland, Pa. He afterward became secretary and treasurer of the Aetna Iron Works, Newcastle, Pa. When this company was reorganized and its name changed to the Atlantic Iron & Steel Co., Mr. Thompson was made vice president, remaining in this capacity until the company was absorbed by the Republic Iron & Steel Co.

PERSONAL.

P. N. Jones has left the employ of the Westinghouse Co., Pittsburg, to become mechanical engineer of the Pittsburg Railways Co.

Julius Keller, superintendent of the St. Louis foundries of the American Car & Foundry Co., has been promoted to the superintendency of all its foundries.

William H. Hugus, superintendent of the Davidson Works of the H. C. Frick Coke Co., has tendered his resignation to take effect Feb. 1 next.

D. Arthur Burt has left the La France Fire Engine Co. to assume the management of the Amoskeag fire engine department of the International Power Co., with headquarters at Boston, Mass.

F. E. Baxter, division engineer of the Rio Grande & Western railroad, has submitted his resignation, to take effect Nov. 1. He will become general manager of a new construction company.

Linwood C. Taylor has been chosen to succeed the late Charles V. Lord, as president and treasurer of the Union Iron Works, Bangor, Maine, with which he has been connected since its formation.

John Vanderslice has resigned the superintendency of the West Virginia Bridge Co., Wheeling, W. Va., to accept a similar position with the American Locomotive & Machine Works, Montreal, Can.

Richard Hammond, president of the Lake Erie Engineering Works, Buffalo, has been confined to his bed for the past three weeks. He is now improving, however, and hopes to resume business activities in the next ten days.

John C. Greenway, superintendent of the Steel Corporation's mines on the Western Mesabi range, is accompanying the presidential party on its southern tour. Mr. Greenway was an officer in President Roosevelt's regiment of Rough Riders, entering the employ of the Oliver Iron Mining Co., at Ishpeming, Mich., at the close of the war. About six months ago he was transferred to the Mesabi.

William M. Reed, manager of the McKeesport Steel Construction Co., was painfully injured at the company's plant Oct. 19. A quantity of paint was ignited by a flying match head and Mr. Reed was badly burned about the face and hands.

Andrew Carnegie in an address at his installation as lord rector of St. Andrew's University, St. Andrew's, Scotland, declared that five nations or even three in the league of peace, inviting all other nations to join them, would banish all war in the future. Britain, France and the United States are the countries which he would have take the initiative.

Nuts and Bolts Advanced.—Nut and bolt manufacturers during the past week have advanced prices about 10 percent. This action was taken after a conference at which it was decided that an advance was justified by the uniform rise in the prices of raw materials.

The Falls Hollow Staybolt Co. is preparing shipments of hollow staybolt bars for the American Railroad Co., of Porto Rico, and for the Imperial railways of Japan.

ACTIVE DEALING IN INDUSTRIAL STOCKS.

SPECULATION FOLLOWS RELAXATION OF MONEY STRINGENCY.

American Locomotive Becomes a Market Leader—High Mark Set By Steel Common--The Week's Review.

The stock market of the past week was characterized by the most extensive dealing since the opening of the recent period of money stringency. Sales on Monday passed the million-share mark and trading was strong and uniform throughout the week. A relaxation of money conditions was the occasion for a burst of speculation which carried the prices of securities to new levels, where they were held with but little reaction by continued active dealing. Industrial specialties were the market features, largely supplanting the railway securities which had held the lead for some weeks. The attention of the public apparently was suddenly directed to the unprecedented earnings and prospects of a number of manufacturing concerns and stocks long neglected found themselves favorites. Railway equipment securities enjoyed a burst of popularity which was easily accounted for by the announcements of present and future railroad needs. American Locomotive was the leader in this line, recording and holding heavy advances with trading in the common passing the 300,000-share mark for the week. American Car and Foundry, Pressed Steel Car, General Electric and Westinghouse rose steadily, and iron and steel stocks were in good demand. Allis-Chalmers advanced along with other manufacturing stocks, with which it is connected through its directorate. United States Steel set a new high mark for a dividendless stock by selling up to 39⅛ on Monday, but this figure was not maintained. Trading was somewhat lighter on Tuesday, but almost every industrial security held its advance.

Dominion Iron & Steel Co.

At the annual meeting of the Dominion Iron & Steel Co., held at Montreal, Oct. 18, Vice President Frederick Nichols resigned. He had assumed this position when the company was in financial straits with the understanding that he was to retire when it was fairly on its feet. He refused to accept any remuneration for his services, but was tendered a banquet at the St. James Club, and was presented with a silver punch bowl and loving cup. His successor is Louis J. Forget, head of the Montreal banking firm of L. J. Forget & Co., president of the Richelieu & Ontario Navigation Co.; vice president of the Dominion Coal Co., and interested in other industrial and transportation companies. F. P. Jones,

THE LEADING INDUSTRIAL SECURITIES.

	Closing Quotation, Oct. 16	Closing Quo. Oct. 23	Changes	Date of 1905 Ann. Meet.	Par Value	Capital Outstanding	Dividend		
							Basis	Being Paid	Date Last Div. Dec.
Allis-Chalmers Co.	17⅝	20¼	+2⅝	Sept. 7	100	19,820,000		.....	.....
Allis-Chalmers preferred	60⅜	63½	+2⅜		100	16,150,000	7 cum	.....	Feb., 1904
American Can	10⅜	11¼	+ ⅞	Feb.	100	41,233,300		.....	.....
American Can preferred	71½	72¾	+ ⅜		100	41,233,300	7 cum	5 Q.	Oct., 1905
American Car and Foundry	37¾	42	+4⅜	June 29	100	30,000,000		.....	May, 1905
American Car and Foundry preferred	100	102½	+2½		100	30,000,000	7 n. c.	7 Q.	Oct., 1904
American Locomotive	59⅜	68⅝	+8⅛	Oct. 17	100	25,000,000		.....	.....
American Locomotive preferred	113½	117	+3½		100	24,100,000	7 cum	7 Q.	Oct., 1905
American Shipbuilding	57⅛	57	— ⅛	Oct. 4	100	7,000,000	4	4 Q.	Dec., 1905
American Shipbuilding preferred	105	105	.....		100	7,000,000	7 n. c.	7 Q.	Oct., 1905
American Steel Foundries	12½	14	+1½	Oct. 3	100	17,700,000		.....	.....
American Steel Foundries preferred	44⅞	46⅝	+1¾		100	17,700,000	6 cum	.....	Aug., 1904
Barney & Smith	15	15	.....	June 6	100	1,000,000		.....	June, 1893
Barney & Smith preferred	130	130	.....		100	2,500,000	8 cum	8 Q.	Sept., 1905
BethlehemSteel	29¼	28⅛	— ⅝	April 4	100	15,000,000		.....	.....
Bethlehem Steel preferred	86	89	+3		100	15,000,000	7 n. c.	7 Q.	Nov., 1905
Bullock Electric preferred	114	114	.....	Oct. 1	100	1,000,000	6	6 Q.	Oct., 1905
Cambria Steel	28⅞	29	+ ⅛	March 21	50	45,000,000	6	3 S. A.	Aug., 1905
Cambria Iron	.....	49¼	.....		50	8,468,000	4	4 S. A.	Oct., 1905
Colorado Fuel & Iron	46	46¾	+ ¾	Oct. 16	100	30,132,000	7	.....	Apr., 1902
Wm. Cramp & Sons Ship & Eng. Bldg. Co.	28	28	.....	May 25	100	6,098,000	5	.....	Nov., 1902
Crucible Steel	13⅝	13⅝	.....	Oct. 18	100	25,000,000		.....	.....
Crucible Steel preferred	67⅛	67⅞	+ ⅛		100	25,000,000	7 cum	.....	Sept., 1903
Empire Steel	6	6	.....	Feb. 22	100	2,281,400		.....	.....
Empire Steel preferred	35	35	.....		100	2,500,000	6 cum	3 S. A.	Jan., 1905
Fay & Egan	60	60	.....	Feb. 21	100	1,000,000	5	5 Q.	.....
Fay & Egan preferred	122	122	.....		100	1,000,000	7 cum	7 Q.	Aug., 1905
General Electric	180	189¾	+9¾	May 9	100	48,256,050	8	8 Q.	Oct., 1905
International Pump	26½	28¼	+1¾	June 6	100	12,262,500		2	July, 1905
International Pump preferred	83½	82	—1½		100	8,850,000	6 cum	6 Q.	Nov., 1905
Lackawanna Steel	80	80	.....	March 8	100	34,971,400		.....	.....
Lake Superior Corporation	17	17	.....		100	40,000,000		.....	.....
Niles-Bement-Pond	126⅛	126½	.....	Feb. 1	100	5,000,000	6	6 Q.	Sept., 1905
Niles-Bement-Pond preferred	108	108	.....		100	2,000,000	6 cum	6 Q.	Aug., 1905
Otis Elevator Co.	60	62	+2	March 29	100	6,350,300		2 A.	Apr., 1905
Otis Elevator Co. preferred	107	106	—1		100	5,589,500	6 n. c.	6 Q.	Oct., 1905
Pittsburg Coal Co.	15⅛	15⅝	+ ⅝	Feb. 11	100	30,135,000		.....	.....
Pittsburg Coal preferred	57¼	57	— ¼		100	30,716,200	7	.....	Apr., 1905
Pressed Steel Car	46¼	52⅛	+5⅞	Feb. 15	100	12,500,000		3	Aug., 1904
Pressed Steel Car preferred	97⅞	100⅞	+3		100	12,500,000	7 n. c.	7 Q.	Aug., 1905
Pullman Palace Car	252	252	.....	Oct. 19	100	74,000,000	8	8 Q.	Nov., 1905
Railway Steel Spring	43¼	46⅝	+3⅜	March 2	100	13,500,000		4 S. A.	Oct., 1905
Railway Steel Spring preferred	100	104	+4		100	13,500,000	7 cum	7 Q.	Sept., 1905
Republic Iron & Steel	26	26½	+ ½	Oct. 18	100	27,352,000		.....	.....
Republic Iron & Steel preferred	95⅜	97¼	+1⅞		100	20,852,000	7 cum	7 Q.	Oct., 1905
Sloss-Sheffield	70	72¾	+2¼	March 15	100	7,500,000	5	5	Oct., 1905
Sloss Sheffield preferred	110	110	.....		100	6,700,000	7 n. c.	7 Q.	Oct., 1905
Tennessee Coal & Iron	86½	89	+2½	May	100	22,552,800		4 Q.	Nov., 1905
Tennessee Coal & Iron preferred	.....	.....	.....		100	248,300	8 cum	8 Q.	Nov., 1905
U. S. Cast Iron Pipe & Foundry	37⅞	39¼	+1⅜	June 28	100	12,500,000	1	1	Oct., 1905
U. S. Cast Iron Pipe & Foundry preferred	96⅞	97	+ ⅛		100	12,500,000	7 n. c.	7	Dec., 1905
U. S. Steel	38	38¾	+ ⅜	April 17	100	508,302,500		.....	Dec., 1903
U. S. Steel preferred	104⅛	105⅝	+ ⅛		100	360,281,100	7 cum	7 Q.	Aug., 1905
U. S. Steel 5's	98⅛	99	+ ⅛		100	463,798,000	5	5 A.	.....
Virginia Iron, Coal & Coke	39¾	41¼	+1½	Sept. 19	100	8,641,000		.....	.....
Westinghouse Electric	167½	172	+4½	June 28	50	20,996,350	10	10 Q.	Oct., 1905
Westinghouse Air Brake	149⅝	149¼	— ¼	Oct. 3	50	10,990,450	20	20 Q.	Oct., 1905

lately selling agent of the company, was appointed director of works in place of Graham Fraser, retiring. E. R. Wood, of Toronto, was added to the directorate. President Plummer announced that the company's earnings for the last four months had exceeded $73,000 per month, while interest charges were $56,000, leaving from $16,000 to $17,000 per month for any purpose the directors saw fit.

American Locomotive Co.

At the annual meeting of the stockholders of the American Locomotive Co., held in New York last week, George W. Hoadley and W. Steward Webb resigned as directors. They were succeeded by C. A. Coffin, president of the General Electric Co., and E. C. Converse, a director of the Steel Corporation, who also entered the Allis-Chalmers Co. board a short time ago. Otherwise the old directors were retained. The *Wall Street Journal* estimates that the common stock of the American Locomotive Co. now represents cash investments and liquid assets equal to $72 per share.

Crucible Steel Co.

The prediction that the increased earnings of Crucible Steel Co. would render it unnecessary to issue any part of the $7,000,000 bonds authorized a year ago, was verified at the recent annual meeting when the authorization was rescinded. A resumption of the preferred dividend in part, probably on a four percent basis, is now predicted for either December or March. The preferred dividend, which is seven percent cumulative, was suspended two years ago.

Colorado Fuel & Iron Co.

The Colorado Fuel & Iron Co., according to President Hearne, in the last fiscal year ending June 1, produced as follows: Coal, 4,504,750, an increase over the previous year of 33 percent; coke, 948,553, an increase of 85 percent; iron ore, 493,570, an increase of 150 percent; limestone, 213,007, an increase of nearly 100 percent, and iron and steel, 1,444,177, an increase of 95 percent. The 1905 production fell short of the 1903 record except in iron and steel. The gross earnings over the year previous increased 115.8 percent.

Financial Notes.

Directors of the United States Steel Corporation will hold their quarterly meeting Oct. 31.

The United States Steel Corporation's employes number 160,000 and are paid $115,000,000 in wages and salaries annually.

The United States census report estimates the annual earnings of American railways at over $1,900,000,000. The equipment is valued at $6,300,000,000.

Dividends paid by the Thomas Iron Co., Easton, Pa., since it was first chartered in 1854 have amounted to 365 percent. In addition to this stock dividends have aggregated more than $2,000,000, in all over 600 percent.

The Pittsburg Steamship Co., the marine branch of the Steel Corporation, is expected to return gross earnings for this season of more than $10,000,000, which will be $3,250,000 more than was earned last year, and nearly $1,000,000 more than in 1902, so far the heaviest in its history.

The Pullman Co. during the fiscal year ending with July, made 13.58 percent on its stock after deducting operating expenses and fixed charges. The surplus for the year over dividends was $4,134,571, which added to the previous surplus, made a total of $22,151,946, equivalent to 27.68 percent of the capital stock.

Charles G. Dawes in a recent address at Chicago defended the practice of issuing watered stock. Instead of being a device employed by gigantic trusts for robbing the public, he declared it is a necessary device of modern business. The intrinsic value of the stock as compared with the entire worth of the business, he said, should be considered rather than the face value of the paper.

MINING INSTITUTE

HOLDS SUCCESSFUL MEETING ON THE FAMOUS MENOMINEE RANGE.

Many Mines of District Inspected—Good Attendance From Various Sections—New Officers Chosen.

(Special Correspondence.)

IRON MOUNTAIN, Mich., Oct. 24.—The eleventh annual meeting of the Lake Superior Mining Institute was held here and at other points on this, the Menominee, range, last week, and was exceedingly well attended, considering the difficulty of reaching this section and the well-known paucity of accommodations in these small towns. The committees in charge had an arduous task to make all comfortable, but did so, and the sessions of the institute passed off with no delays and strictly according to program, from start to finish. There was an attendance of about 250, more than 200 on the first day, and the importance of the institute is gauged by the fact that this attendance was from points very widely separated, and all lake mining districts, both iron and copper, were well represented. Reports of officers showed an active membership of about 350, and 62 were elected during the session. The institute has a cash surplus in its treasury of about $3,600, and is a growing factor in the mine life of the greatest mining region of the globe, the Lake Superior country. This region is admittedly in advance of all others in point of modern methods and the daring and skill of its operations, in the size and richness of its ore bodies, and in the economy of their operations. It also leads in the humanity shown by its superintendents and in the loyalty and devotion of the mass of its employes.

SOUVENIR BADGE.

President O. C. Davidson, in his address at the opening of the meetings, welcomed the delegates, and said the greatest benefit of such a gathering comes from the acquaintances made and the exchange in "heart to heart talks" of trials and tribulations.

The Officers Elected.

The program called for two evening sessions, at which various papers were read and slightly discussed, and during which the annual reports of the officers were read and approved, and officers elected. There were few changes other than in the positions of president and vice president.

The complete list of officers chosen is: President, James MacNaughton, Calumet; vice presidents (two years), F. W. Denton, South Range, J. M. Longyear, Marquette; managers (two years), James R. Thompson, Ironwood, F. A. Vogel, Florence; secretary, A. J. Yungbluth, Ishpeming; treasurer, E. W. Hopkins, Commonwealth.

The program also called for visits to the Oliver Iron Mining Co.'s group at Iron Mountain and Norway, the Crystal Falls mines ofCorrigan, McKinney & Co., and those of the Penn Iron Mining Co., at Norway and Vulcan. A few small isolated mines, including Florence, Monroe and Traders, were also inspected, as they were in the line of march. The railroads connecting various parts of the district made it easy to get to all points desired by affording special trains everywhere, and the

citizens of the Menominee towns provided entertainment and put themselves out to see that the visitors missed nothing that was of interest. A unique feature of the trip was a number of visits to the manufacturing end, represented by the Escanaba ore docks, of which there are now six, with another under construction, to the Gladstone charcoal furnace and chemical works, where wood is carbonized and its by-products saved, to the immense woodworking factory of the I. Stephenson Co., the great tie-preserving plant of the Chicago & Northwestern road, and the interesting ore-crushing plant of the Oliver Iron Mining Co.

Some Interesting Mines.

The chief mine operator on the Menominee is the Oliver company, and second comes the Cleveland firm of Corrigan, McKinney & Co., whose seat is at Crystal Falls, where it has developed some very good mines, of which the Great Western, Tobin and Crystal Falls, easily lead. Pickands, Mather & Co. will make a 300,000-ton product on the Menominee this year. The Oliver mines are the immense Chapin, whose annual product is about 970,0000 tons, the Aragon, with some 430,000 tons this year, and a half interest in the Pewabic, with about 530,000 tons this year. This company also owns some scattering mines near Crystal Falls, the Iron River group and some lesser properties elsewhere, none of which were visited. Chapin is now employing about 3,000 men and is sinking the immense C shaft, steel frame and 1,600 ft. deep. This is to be completed during the coming year. In this shaft is to be installed the Cornish pump that was taken out of one of the same mine's shafts in 1896.

The large ore concentrating plant of the Pewabic company is now being refitted and will be put in operation in a short time. It is the only one in the lake region, though others will probably be in operation further west in a short time. This plant was run some time ago, but has been idle for some years. The Pewabic mine is employing at the present time some 525 men, and has just placed a fine triple Prescott pump good for 1,200 gallons a minute from 1,200 ft. depth. This is a duplicate of the Oliver company's pump recently placed at the Aragon, where it is giving excellent service at high efficiency. None of the members of the institute went under ground at either of these mines.

At Quinnesec Falls, some three miles from the mines, the Oliver company has a large water power and is compressing air for the operation of its Chapin mine. It is understood that additions to the plant will soon be made to serve others, possibly either Aragon or Pewabic or both. There are four immense compressors at this works, which were visited by none of the members of the institute at this trip, on account of other engagements.

Well-Equipped Plants.

The same day in which the members saw the mines of Iron mountain they also visited the Tobin and Great Western, with a stop at Florence on their way. The appearance of things about the Tobin was especially interesting, and it was found to have a most serviceable and complete equipment on the surface, compound balance hoists, imperial compressors, fuel economizers, fan draft, and the like, and it is rapidly growing into importance as a large mine. It is the newest mine on the Menominee range, and one of the very few recent explorations that have developed into anything of moment. It is only about two years old, but mines this year 240,000 tons. Great Western is another well-equipped mine and is making a larger product than Tobin. It has been in considerable trouble from the drawing of its main shaft into the adjacent open cave, but this has been saved by filling the pit. Water is pumped by one of the Rand Drill Co.'s Harris air lifts, a compressor hitched to two tanks which it alternately fills and empties of air, throwing a constant stream of water by the suction and pressure. The pump is now handling about 800 gallons a minute, has a much higher capacity, and is able to handle water that is almost half sand, this making it especially desirable for such a situation as at Great Western, where it is pumping surface water that drains into the pits of the mine.

The Penn Iron Mining Co. is now erecting at Sturgeon falls, on the mouth of the river of that name, a dam that will give 22 ft. effective head, and it will have nearly all its mine plants running from this works in about ten months. The dam will give some 2,500 horsepower, and the installation is to be two 1,500-k. w. generators, one at first, the second later. All hoists of the mines, except one first motion, are to be replaced by efficient machines operated electrically, and the pumping is to be by six-stage horizontal centrifugal pumps, set on both sides of a motor. These pumps are to have a constant speed, and are to be regulated by throttles on the outlets. It is supposed that contracts will be let in a few days for the machinery required. Work at the dam so far consists of cofferdams behind which men are cleaning off the bedrock preparatory to making the dam proper, which is to be of concrete and will be set on bedrock without anchorage other than the irregularities of the rock itself. Foundations for the power house are now being placed. The distribution of current is about four miles, and will probably be at a voltage of about 6,600, though this has not yet been definitely determined. These mines produce about 425,000 tons of ore this year, and the fuel charge, for this and the water pumped, is a very large one. The normal flow of water in these mines is considerably less than the 1,300 gallons they are now pumping, though there have recently been flows as high as 2,000 gallons per minute. The company owns a large area of lands along the mineral-bearing formation, and has much opportunity for further development of mines, which it is said will be soon undertaken.

Possibilities of Development.

This is true also of the Crystal Falls district, which appealed especially to the drill men and explorers among the members of the institute, who thought they saw in both these regions vast fields for future explorations and the probability of vaster deposits of ore than have yet been found therein.

At Norway is the Aragon mine, of the Oliver company, which was looked over on the surface after the Penn mines had been left behind. This is one of the best equipped mines of the Menominee district, and is now said to be looking better underground than of late, and to be giving assurance that its ore bodies are of larger size and greater permanence than had been supposed for a time. No. 5 shaft of this mine has a splendid steel headframe, and is equipped with a big Prescott triple pump, and a fine double Sullivan automatic hoist of the latest pattern. There is also a pneumatic haulage plant underground that is giving most efficient service.

The Papers at the Meetings.

The list of papers read at the evening meetings was rather short but included these:

"The Unwatering of the Hamilton Mine," by John T. Jones, Iron Mountain; "The History of the Menominee Range," by H. S. Buel, Quinnesec; "Cargo Sampling of Iron Ore Received at Lower Lake Ports—Including Methods Used in the Analysis of the Same," by W. J. Rattle & Son, Cleveland; "Notes on Some Recent Changes in the Equipment of the Republic Mine," by Frank H. Armstrong, Vulcan, Mich.; "Methods of Iron Ore Analysis Used in the Lake Superior Mining District," by W. A. Siebenthal, Republic, Mich.; "Rateau Exhaust Steam Regenerator System," by L. Battu, Chicago, Ill.; "The Method of Surveying for Secondary Mine Openings," by Floyd L. Burr, E. M., Vulcan, Mich. There were also some minor papers on other topics, most of which were given without notes.

J. H. WILLIAMS & CO'S DROP FORGING PLANT.

Crude Oil for Heating Furnaces; Power from Outside Source; Conveniences for Employes.

(BY AN EDITORIAL REPRESENTATIVE OF THE IRON TRADE REVIEW.)

The remodeled plant of J. H. Williams & Co., Brooklyn, N. Y., is probably the most highly specialized and most extensive establishment for the production of wrought metal articles and machinery parts in the world. Every possible portion of the two city blocks which it occupies is given up to the production and finishing of drop forgings. Even the power plant and coal bunkers are almost

THE OFFICE.

entirely eliminated, power being supplied from an outside source and the fuel for heating for forging—crude oil—being drawn from an underground reservoir filled from a point outside the walls. It is an example of strict adherence to one line of industry, permitting no exterior enterprise to encroach upon the main purpose of the establishment.

The plant is now one continuous whole, the street dividing the two blocks having recently been acquired from the city. The buildings are grouped in a manner

THE LAVATORY.

suggesting a constant growth and expansion of business, but the arrangement for convenience and economy of space gives evidence of a general design. The chief structures are the new main building; the forge shops, of which there are three; the power house; and the blacksmith shop. Comparatively little yard space is needed, for practically the only material required is in the form of blooms, billets and bars, which are stored in racks in a centrally located building between the forge shops.

The New Building.

The building recently completed is in reality an addition to an older structure of the same width and height, which it carries across the closed street to the limit of the adjoining block. The new portion is 260 ft. long and 50 ft. wide, having four stories and a basement. It is of

THE CLUB ROOM.

standard mill construction, the wood framing being reinforced with steel columns and girders. The floors 7⅛ in. thick are of three thicknesses, two layers of matched pine laid diagonally, and a top of grooved and tongued maple with seams running parallel with the sides of the building. All floors are carefully waterproofed between the layers. Automatic fire doors are provided, and all floors are protected with a sprinkler system. The piping is all exposed and the lines of the various systems—

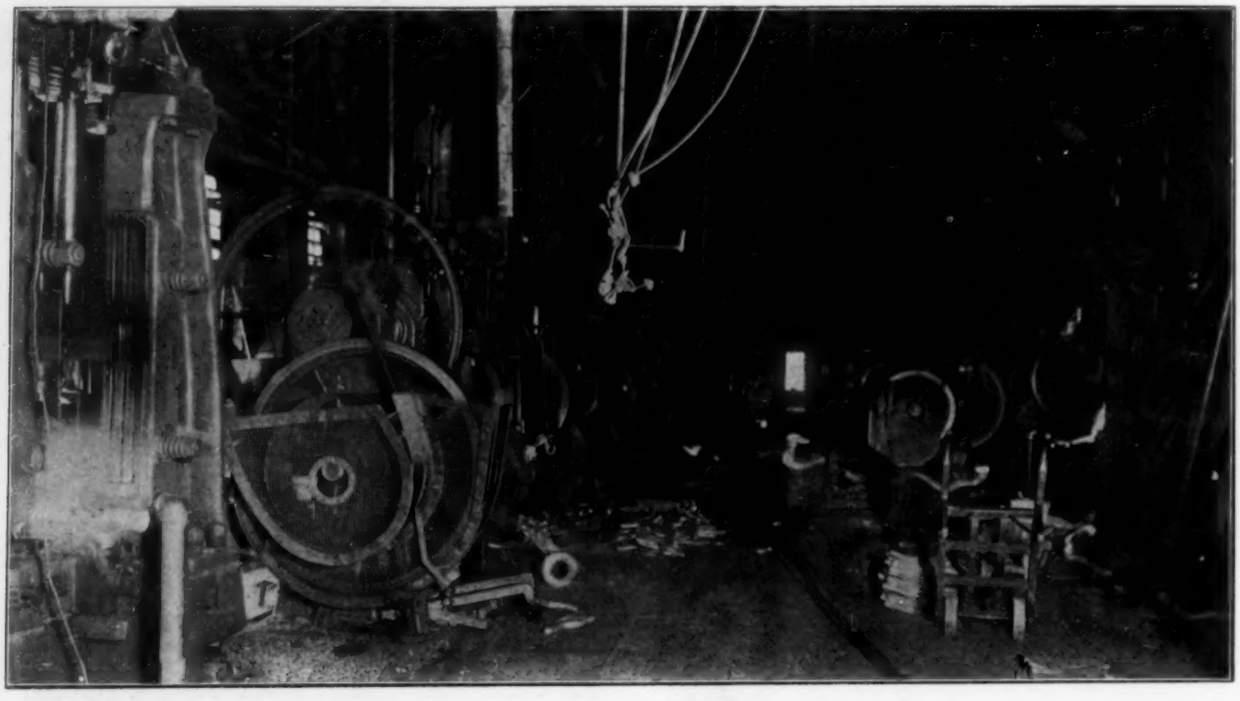
THE DIE SHOP.

water, gas, steam and electric conduits—each painted an individual color. Thus one line is green, another red, a third white, a fourth black and a fifth gold. This obviates the necessity of tracing each pipe to its source whenever a line is to be tapped.

The basement is employed for storage and stock rooms. The first floor contains the tool and stock room, the cold

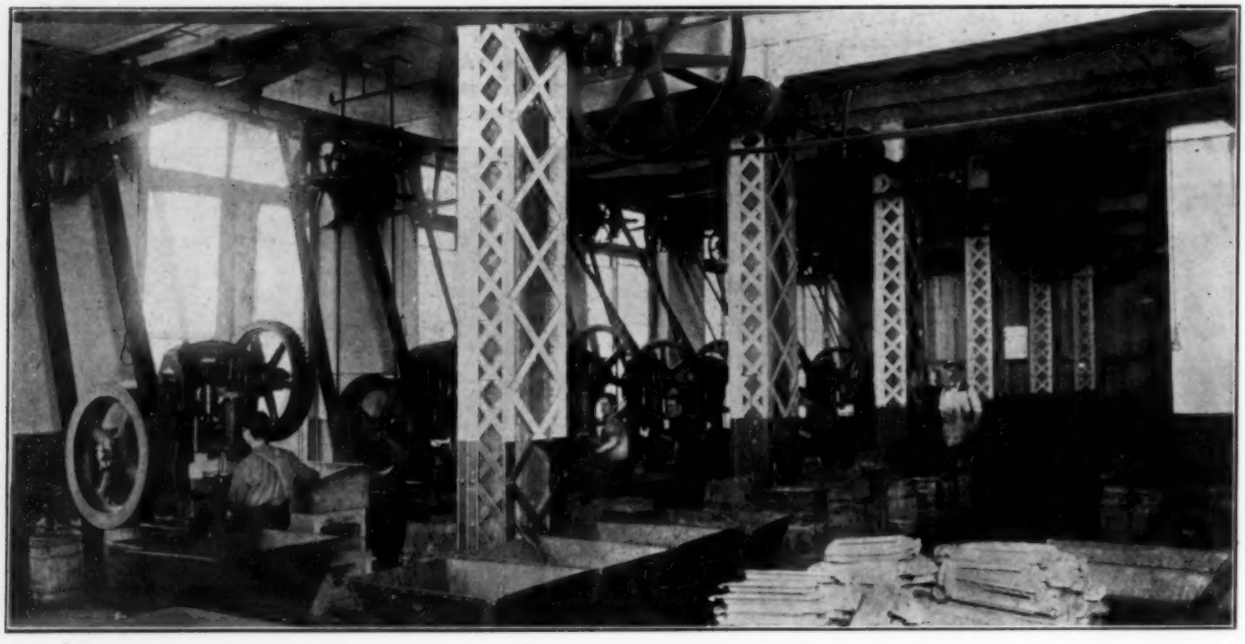
trimming room and the hospital; the latter being fitting up almost as perfectly and as completely as the operating room of a first-class public hospital.

The trimming room, where the fins are removed from the forgings as they come from the forge shops and pickling room, contains 14 presses made by the E. W. Bliss Co. and the Farrel Foundry & Machine Co. Power is supplied by a 20-h. p., three-phase alternating current motor. Current is taken from the lines of the Brooklyn Edison Co., at 6,000 volts, and is stepped down to 220 volts by six static transformers.



FORGE SHOP.

On the second floor is the die room, where all the forging and trimming dies are made. Of the 375 men employed about the plant, 45 work in this room. The machinery is driven by a motor of the same type as that employed in the room below. Westinghouse motors are used throughout the works. The die room equipment includes Pratt & Whitney die sinking machines, Harrington lathes, Gould & Eberhardt shapers, Pond planers, Barnes & Prentiss drills, a Brown & Sharpe milling machine, a wet grinder of the same make, and several cold saws made by the Higley Machine Co.



TRIMMING PRESSES.

The finishing department occupies the third floor. Here all the stock goods produced by the firm are finished,

wrenches milled, chain pipe wrenches and vises finished and the chains for these two standard tools made. The equipment includes Bliss punching presses for making chains, Cleveland automatic screw machines, three Higley cold saws, 30 milling machines of various makes, including Hendey, Harrington and Cincinnati machines, and about a dozen Prentiss & Barnes drill presses. About 50 men are employed in this department.

At the other end of the building, in the old part, 100 ft. long, is the tool making department, which gives employment to some 10 men. The equipment includes the following tools, all belt-driven on the group plan by an electric motor: A Gray planer, a Bradford lathe, a Cincinnati universal milling machine, four toolmakers' lathes, a Flather and a Hendey shaper, and two Prentiss drill presses.

The grinding and finishing room is also on the third floor. It is equipped with a Sturtevant exhaust system, which is so effectively arranged that the 15 men busy at the grinding wheels work in an atmosphere as free from dust and dirt as that of any other room in the building.

FINISHING ROOM.

The fourth floor contains the general offices, the drafting room, the sample room, the central telephone station, and the library. The offices are admirably arranged for both comfort and convenience, affording an abundance of room, light and air. The aisles are broad and the furniture is of uniform design. The booth exhibited by the firm at the Louisiana Purchase Exposition is set up complete on this floor and serves to show visiters the variety of forms made in the shops. Of unusual interest is a series of prints and engravings illustrating the art of forging in all ages, gathered in different parts of the world by Mr. Williams, the founder of the firm, and Mr. Redfield, the present head of the company.

For Employes.

It would be difficult to find another manufacturing plant in which so large a proportion of the space is devoted to the comfort and convenience of the workmen and in which the arrangements are more perfect. Besides the hospital already mentioned, there is a well-stocked library and assembly room, a system of wash rooms and a refrigerating plant, maintained solely for the purpose of cooling drinking water.

The library, which forms the chief center of interest in the assembly room, is in charge of one of the office employes. Besides the private library of the firm, it has a branch of the Brooklyn public library. The room is designed to serve as a reading and club room. There are seats to accommodate some 200 persons, arranged as in a lecture room with a platform, and even a piano. Here the men are encouraged to assemble during the luncheon hour and in the evening. Files of the daily papers, the principal magazines and the technical journals are open to all. The company encourages meetings of its men and the workmen maintain a mutual aid association to which all of the employes are admitted under certain conditions. A baseball team, uniformed and equipped at the firm's expense, is only one of the things which help to account for the spirit of wholesome co-operation which prevails in the shops.

The wash rooms are fitted with open plumbing and porcelain fixtures. There are three of these in the main building, each equipped with individual wash basins and lockers, and each having seven shower baths with the most improved sprays and rubber curtains. In the forge shops there are two large wash rooms, in which shower baths are even more plentiful.

Solicitude for the welfare of its men is one of the traditions of J. H. Williams & Co. Speaking with one of the leading employes he said: "It pays. It attracts the most desirable class of workmen. There is not one among the boys—" waving a hand in the direction of each of the

buildings—"to whom I should hesitate to introduce my wife."

The Forge Shops.

All three of the forge shops are operated by electric motors. In the forge shops proper there are about 65 hammers, including steam hammers, drop hammers, trip hammers and upsetting machines. The fuel employed in the heating furnaces is crude oil, drawn from two 15,000-

STORAGE ROOM.

gallon tanks, situated 9 ft. under ground and distributed by the Gilbert & Barker system. The oil is received at a station on the water front and transferred to the tanks as required by means of tank wagons.

A feature of the forge shops is a system for cooling the air for the men who operate the hammers. A few inches above the head of each operative is a sheet iron pipe, which delivers cool air supplied by a fan situated in the roof of the building.

The annealing and tempering department gives employment to about 15 men. It contains Brown & Sharpe annealing and case-hardening furnaces, an American gas furnace, and several furnaces of the company's own design. Oil baths, brine tanks, etc., complete the equipment.

Adjoining the annealing and tempering room is the

ANOTHER VIEW OF THE TRIMMING ROOM.

chemical laboratory. The chemist samples the entire shop every day, picking up forgings at random and subjecting them to both physical and chemical tests, as well as testing each lot of steel as it arrives in the works.

Auxiliary Departments.

The steel, of which many different varieties are employed, is stored in racks so arranged that the ends of the bars and billets are presented to view. These ends are painted in colors, each representing a particular grade of metal. This greatly facilitates the selection of the proper material for any particular order. Instead of indicating the physical and chemical properties of the steel required, it is only necessary to state the color upon the order slip. In the steel receiving and storage department there are two motor-driven Hilles & Jones shears, one capable of cutting 5-in. square stock.

A repair shop contains a traveling and a jib crane for handling large pieces, two Pond planers, one of large size, two Gould & Eberhardt shapers, two Putnam lathes, a speed lathe and radial drills.

The blacksmith shop is equipped with a jib crane for handling billets, seven fires, a set of forging rolls and two McDougal & Potter steam hammers. The pickling room for removing scale from the rough forgings is not far distant. Hoods over the pickling tubs carry off the fumes and a trolley facilitates the lifting and transportation of the baskets.

For a plant of its size and output the power equipment of the J. H. Williams & Co. has been reduced to very near the absolute minimum. It contains only one engine, soon to be superseded by electric motors, a Hall air compressor for the fuel oil system an Epping-Carpenter pump for the plunger elevators, of which there are four in the main building, and a refrigerating machine for cooling drinking water.

NATIONAL FOUNDERS' ASSOCIATION.

Important Subjects to be Discussed at the New York Meeting.

The ninth annual convention of the National Founders' Association, which will be held at the Hotel Astor, New York, Nov. 15 and 16, promises to be one of the most important in the history of the association. After the appointment of committees and receiving of reports of officers, the following subjects will be considered:

Education of Apprentices.

How best results may be obtained.

Report of committee on Training School.

Best methods to be adopted to bring to justice law-breakers, sluggers, murderers and intimidators.

Desirability of protecting members of the association against the organization of foundry helpers, chippers, cleaners, and cupola tenders.

Machine Operators.

How to obtain the best results with molding machines.

Field Force.

To what extent shall this branch of work be continued or enlarged.

Co-operation with Kindred Associations.

Report of Committee.

Discussion.

Report of Special Finance Committee.

Miscellaneous.

Any member wishing to bring before the Convention subjects pertaining to the welfare of the Association, not heretofore touched upon, will be afforded an opportunity at this point.

After all other business has been transacted, officers will be elected. On Wednesday evening, Nov. 15, there will be a banquet, at which addresses will be made by speakers of national reputation. The association has a large membership, consisting of firms located all over the United States. It was organized in 1898. The secretary is F. W. Hutchings, Detroit, Mich.

SEGREGATION IN STEEL INGOTS.*

BY B. TALBOT.

The author has felt some little trepidation in bringing a paper on the above subject before the members of the institute. On the one hand, the facts set forth in the following pages are, in a general way, known to all practical steel manufacturers and engineers, whilst on the other hand there has been rather a tendency in many quarters to ignore the subject as one into which it is perhaps better not to make too close an investigation.

The fact that segregation takes place in ingots appears to have been first discovered by Mr. Stubbs, who brought it before the notice of the institute in the discussion on a paper by Mr. Parry, read in 1881. The subject was then taken up by Mr. Snelus, who published his results in the same year, completely confirming Mr. Stubbs' earlier observations. Some years later Mr. Eccles read a paper before the institute on an imperfection in mild steel plates considered chemically, in which the effects of segregation

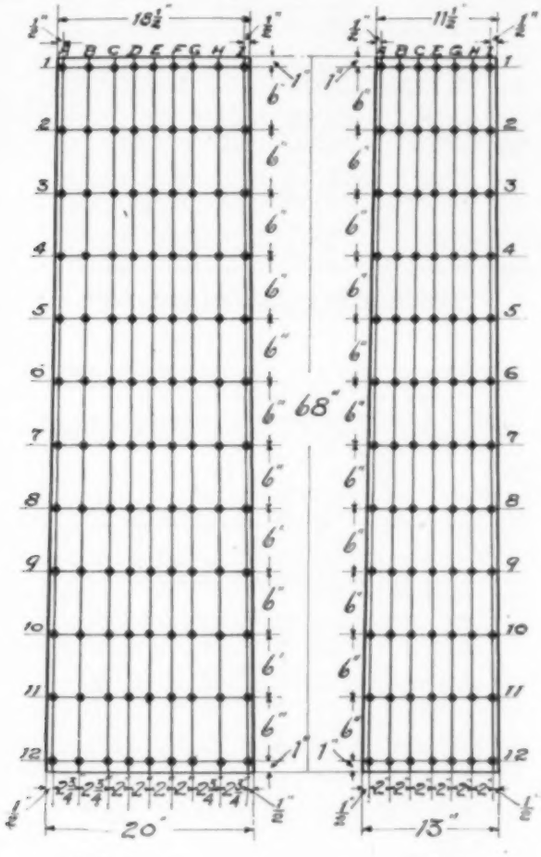


FIG. 1. FIG. 2.
TEST INGOTS SHOWING METHOD OF DRILLING.

in plates were clearly set forth. Since that date other observers have from time to time drawn attention to the subject, such as the paper by Hogg read before the Society of Chemical Industry, and one by Pourcel read at the Chicago meeting of the American Institute of Mining Engineers, in 1893. There is also a good resumé of the subject in Howe's work on the Metallurgy of Steel.

Although the above papers draw attention to the effects of segregation in ingots and rolled products, very little appears to have been published as regards any means of lessening the amount of such segregation. It appears to have been pointed out by Pourcel as early as 1893 that aluminum has a decided tendency to prevent segregation, but the author has not met with any systematic series of tests to prove the point. The following results, therefore, in which parallel tests have been made on ingots from the same heat, with and without the addition of a small amount of aluminum to the ingot, may prove of interest.

The ingots taken for examination were from both acid and basic open-hearth furnaces, and varied in weight from about 1½ to 3½ tons, and it may be noted here in passing that the smaller ingot showed the effect of segregation quite as distinctly, if not more so, than the bigger ingots tested.

The height of the ingots was about 5 ft. 6 in., and Figs. 1 and 2 have been prepared in order to show how the drillings were taken over the whole surface of the divided ingot.

The heading found at the top of each of the tables given in the following pages sufficiently indicates in what manner the effects of the segregation were looked for both in the ingot and subsequently in the bloom and billet.

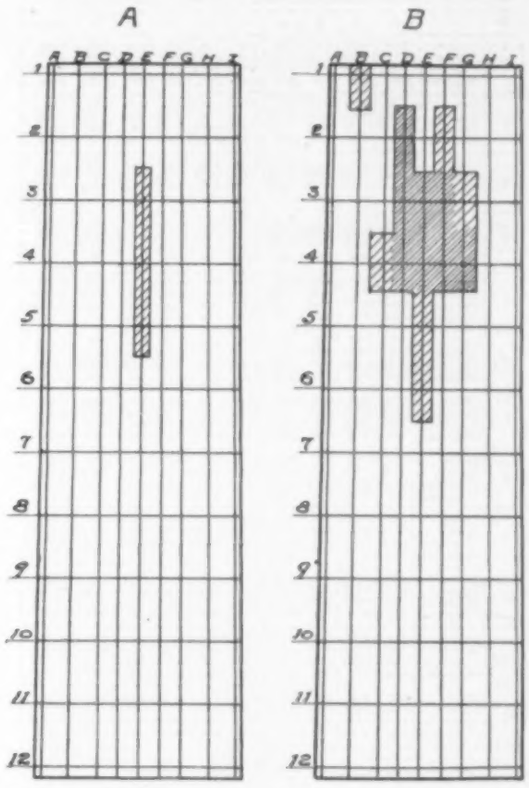


FIG. 3.—SEGREGRATION OF SULPHUR IN THE SAME HEAT IN THE CASE OF TWO INGOTS.

A, with Aluminum: B, without Aluminum. Parts shaded show the areas in which the sulphur has increased 25 per cent over ladle test. The darker shading shows approximately areas with over 75 per cent increase of sulphur.

As a rule, the results show that in the case of ingots to which no aluminum has been added, excessive segregation down the central line of the ingot occurs from about 6 in. from the top to about half way down the ingot, that sulphur is the element which tends to segregate most, phosphorus next, followed by carbon, and finally manganese, the segregation of which latter element is so slight as to be almost negligible. No silicon determinations were made, as the amount of this element present was extremely small. The analyses given under the heading "Average of the whole ingot," are obtained by

* A paper presented at the meeting of the Iron and Steel Institute at Sheffield, England, Sept. 26-29, 1905.

taking the average of all the analyses of that ingot, and this average analysis will be found to agree very closely indeed with the analysis of the ladle test. In considering the following tables, attention must first be drawn to the fact that the various heats have not been all cast and prepared in the same way. The first two tables, A and B, refer to ingots which were bottom-cast simultaneously from the same acid steel heat, the only difference being that the one was cast in a larger ingot mold than the other. A portion of the ferro was added in the ladle, but the desired carbon was obtained by catching the metal as it came down.

Tables C and D refer to two acid steel ingots from the same heat, which were cast side by side, but were top poured instead of being bottom poured. Aluminum was added to the ingot in the case of Table C, but none was added in the case of Table D. In this case also the carbon was retained in the bath of steel, which was tapped at the desired percentage.

TABLE A.—*Analyses made on a 20-inch by 24-inch by 68-inch Acid Steel Ingot. Heat D, 2072. Weight of Ingot, 7500 lbs.*

Ingot was bottom poured, allowed to cool, and was then cut through the centre of the 20-inch side longitudinally. Drillings were taken from holes ½-inch diameter by ½-inch deep on planed surface at intersection of lettered and numbered lines as shown on Fig. 1.

No.		A.	B.	C.	D.	E.	F.	G.	H.	I.	Average.
1	Carbon	0·33	0·35	0·31	0·30	0·32	0·34	0·31	0·33	0·35	0·330
	Sulphur	0·042	0·039	0·023	0·094	0·037	0·033	0·030	0·036	0·041	0·0339
	Phosphorus	0·036	0·039	0·032	0·034	0·039	0·034	0·037	0·039	0·042	0·0368
	Manganese	0·55	0·53	0·51	0·52	0·50	0·53	0·52	0·52	0·51	0·520
2	Carbon	0·38	0·43	0·46	0·37	0·47	0·55	0·48	0·43	0·34	0·456
	Sulphur	0·043	0·039	0·039	0·106	0·071	0·094	0·073	0·047	0·039	0·0609
	Phosphorus	0·040	0·039	0·043	0·092	0·067	0·079	0·064	0·055	0·037	0·0618
	Manganese	0·26	0·53	0·26	0·26	0·27	0·27	0·29	0·24	0·33	0·269
3	Carbon	0·35	0·47	0·46	0·39	0·50	0·60	0·45	0·47	0·36	0·453
	Sulphur	0·039	0·053	0·069	0·131	0·173	0·129	0·069	0·077	0·032	0·0880
	Phosphorus	0·043	0·068	0·068	0·086	0·127	0·098	0·061	0·067	0·043	0·0749
	Manganese	0·51	0·53	0·56	0·59	0·60	0·60	0·57	0·56	0·50	0·556
4	Carbon	0·35	0·46	0·50	0·43	0·67	0·61	0·50	0·50	0·37	0·492
	Sulphur	0·036	0·063	0·080	0·081	0·183	0·080	0·079	0·063	0·049	0·0839
	Phosphorus	0·041	0·070	0·071	0·072	0·134	0·074	0·076	0·070	0·044	0·0724
	Manganese	0·49	0·54	0·59	0·57	0·63	0·56	0·57	0·57	0·52	0·559
5	Carbon	0·37	0·48	0·50	0·42	0·65	0·48	0·50	0·46	0·35	0·468
	Sulphur	0·043	0·072	0·088	0·063	0·185	0·077	0·087	0·081	0·045	0·0933
	Phosphorus	0·047	0·071	0·078	0·065	0·134	0·065	0·070	0·067	0·047	0·0704
	Manganese	0·52	0·54	0·57	0·55	0·60	0·56	0·56	0·50	0·53	0·500
6	Carbon	0·36	0·47	0·47	0·46	0·54	0·46	0·47	0·46	0·37	0·451
	Sulphur	0·041	0·071	0·084	0·081	0·114	0·075	0·085	0·080	0·041	0·0767
	Phosphorus	0·042	0·063	0·075	0·070	0·092	0·061	0·073	0·069	0·041	0·0651
	Manganese	0·60	0·54	0·58	0·57	0·58	0·56	0·57	0·57	0·53	0·556
7	Carbon	0·36	0·43	0·42	0·43	0·43	0·44	0·43	0·45	0·38	0·419
	Sulphur	0·045	0·075	0·074	0·069	0·075	0·070	0·065	0·075	0·038	0·0649
	Phosphorus	0·047	0·068	0·060	0·061	0·065	0·061	0·060	0·064	0·045	0·0590
	Manganese	0·57	0·56	0·54	0·55	0·54	0·57	0·57	0·55	0·54	0·556
8	Carbon	0·38	0·46	0·42	0·42	0·38	0·41	0·43	0·45	0·39	0·413
	Sulphur	0·043	0·063	0·071	0·068	0·062	0·062	0·069	0·071	0·039	0·0631
	Phosphorus	0·049	0·068	0·068	0·067	0·056	0·056	0·064	0·066	0·045	0·0606
	Manganese	0·53	0·56	0·55	0·56	0·54	0·57	0·56	0·56	0·54	0·552
9	Carbon	0·37	0·45	0·44	0·40	0·39	0·41	0·44	0·45	0·39	0·413
	Sulphur	0·044	0·077	0·080	0·062	0·063	0·061	0·081	0·075	0·044	0·0653
	Phosphorus	0·045	0·070	0·067	0·066	0·061	0·057	0·070	0·065	0·046	0·0588
	Manganese	0·53	0·59	0·56	0·54	0·55	0·57	0·56	0·56	0·54	0·556
10	Carbon	0·38	0·46	0·43	0·43	0·40	0·42	0·43	0·45	0·40	0·422
	Sulphur	0·053	0·078	0·067	0·073	0·068	0·062	0·069	0·074	0·047	0·0646
	Phosphorus	0·043	0·070	0·068	0·063	0·058	0·059	0·059	0·065	0·044	0·0557
	Manganese	0·54	0·56	0·56	0·56	0·56	0·55	0·55	0·56	0·54	0·553
11	Carbon	0·38	0·43	0·41	0·40	0·39	0·40	0·42	0·43	0·40	0·406
	Sulphur	0·043	0·069	0·066	0·066	0·059	0·059	0·067	0·067	0·050	0·0607
	Phosphorus	0·054	0·065	0·057	0·057	0·059	0·054	0·060	0·062	0·046	0·0572
	Manganese	0·55	0·56	0·54	0·56	0·54	0·57	0·56	0·55	0·56	0·554
12	Carbon	0·39	0·43	0·45	0·42	0·41	0·43	0·44	0·44	0·39	0·422
	Sulphur	0·046	0·067	0·069	0·068	0·056	0·080	0·071	0·069	0·043	0·0611
	Phosphorus	0·048	0·061	0·056	0·057	0·060	0·062	0·062	0·062	0·046	0·0573
	Manganese	0·56	0·56	0·55	0·55	0·54	0·56	0·56	0·56	0·57	0·557

Average of the whole ingot: C, 0·420; Si, 0·0678; P, 0·0607; Mn, 0·553.
Analysis of ladle test: C, 0·43; S, 0·069; P, 0·062; Mn, 0·55.

Tables E and F refer to two ingots from the same heat of fairly high carbon basic steel. These were cast the one following the other, both being top cast, but in the case of Table E the ingot was inverted immediately after casting.

Table G refers to a mild steel basic ingot, which was also top cast.

Perhaps the chief interest in the foregoing tables consists in a comparison of the segregation shown in the case of the acid steel ingot in Tables C and D, the former with and the latter without the addition of aluminum to an ingot from the same cast of steel. An attempt has been made in Fig. 3 to show by means of a diagram the amount of segregation of the sulphur in these two ingots, and in this case a very marked difference is observable. The shaded portions represent areas on the surface of the

TABLE B.—*Analyses made on a 13-inch by 16-inch by 68-inch Acid Steel Ingot. Heat D, 2072. Weight of Ingot, 3000 lbs.*

Ingot was bottom poured, allowed to cool, and was then cut through the centre of the 13-inch side longitudinally. Drillings were taken from holes ½-inch diameter by ½-inch deep on planed surface at intersection of lettered and numbered lines as shown on Fig. 2.

No.		A.	B.	C.	E.	G.	H.	I.	Average.
1	Carbon	0·37	0·38	0·38	0·38	0·35	0·37	0·42	0·379
	Sulphur	0·051	0·049	0·045	0·039	0·054	0·055	0·062	0·0492
	Phosphorus	0·050	0·044	0·047	0·044	0·045	0·054	0·064	0·0497
	Manganese	0·52	0·54	0·57	0·52	0·53	0·50	0·54	0·540
2	Carbon	0·37	0·38	0·50	0·42	0·48	0·38	0·37	0·443
	Sulphur	0·039	0·045	0·083	0·185	0·088	0·044	0·042	0·0749
	Phosphorus	0·041	0·044	0·072	0·126	0·074	0·052	0·046	0·0664
	Manganese	0·53	0·54	0·56	0·58	0·56	0·52	0·53	0·550
3	Carbon	0·36	0·43	0·51	0·67	0·48	0·41	0·38	0·493
	Sulphur	0·040	0·062	0·085	0·184	0·081	0·049	0·044	0·0779
	Phosphorus	0·035	0·067	0·077	0·150	0·075	0·052	0·047	0·0704
	Manganese	0·50	0·54	0·57	0·61	0·58	0·55	0·53	0·553
4	Carbon	0·37	0·46	0·48	0·74	0·44	0·44	0·37	0·471
	Sulphur	0·041	0·078	0·077	0·277	0·068	0·057	0·039	0·0906
	Phosphorus	0·040	0·067	0·069	0·161	0·062	0·057	0·036	0·0703
	Manganese	0·52	0·57	0·56	0·64	0·55	0·55	0·52	0·560
5	Carbon	0·36	0·47	0·48	0·55	0·46	0·45	0·39	0·451
	Sulphur	0·043	0·079	0·075	0·133	0·076	0·071	0·045	0·0746
	Phosphorus	0·041	0·068	0·074	0·106	0·070	0·060	0·037	0·0660
	Manganese	0·52	0·59	0·56	0·58	0·57	0·56	0·53	0·564
6	Carbon	0·36	0·47	0·50	0·51	0·46	0·46	0·37	0·447
	Sulphur	0·045	0·082	0·098	0·113	0·084	0·077	0·038	0·0786
	Phosphorus	0·047	0·068	0·065	0·089	0·071	0·070	0·043	0·0678
	Manganese	0·53	0·56	0·56	0·57	0·57	0·55	0·53	0·551
7	Carbon	0·37	0·45	0·44	0·47	0·43	0·46	0·39	0·430
	Sulphur	0·052	0·079	0·076	0·104	0·073	0·080	0·046	0·0729
	Phosphorus	0·048	0·065	0·067	0·076	0·060	0·069	0·049	0·0617
	Manganese	0·53	0·57	0·56	0·57	0·55	0·55	0·54	0·552
8	Carbon	0·38	0·46	0·42	0·47	0·43	0·47	0·38	0·430
	Sulphur	0·047	0·080	0·074	0·077	0·070	0·084	0·045	0·0681
	Phosphorus	0·052	0·065	0·061	0·074	0·057	0·069	0·049	0·0624
	Manganese	0·52	0·56	0·57	0·57	0·57	0·57	0·54	0·560
9	Carbon	0·36	0·46	0·41	0·46	0·42	0·47	0·39	0·427
	Sulphur	0·045	0·082	0·067	0·067	0·068	0·077	0·048	0·0649
	Phosphorus	0·047	0·066	0·065	0·068	0·061	0·066	0·048	0·0573
	Manganese	0·53	0·55	0·56	0·57	0·56	0·56	0·52	0·550
10	Carbon	0·38	0·45	0·41	0·43	0·43	0·45	0·38	0·419
	Sulphur	0·054	0·080	0·070	0·071	0·069	0·068	0·048	0·0657
	Phosphorus	0·054	0·064	0·065	0·062	0·061	0·066	0·050	0·0603
	Manganese	0·53	0·54	0·55	0·56	0·55	0·56	0·53	0·554
11	Carbon	0·37	0·45	0·41	0·42	0·42	0·44	0·38	0·413
	Sulphur	0·050	0·082	0·066	0·065	0·071	0·078	0·057	0·0670
	Phosphorus	0·052	0·065	0·061	0·059	0·065	0·066	0·053	0·0601
	Manganese	0·55	0·57	0·54	0·59	0·56	0·56	0·54	0·553
12	Carbon	0·37	0·44	0·42	0·41	0·42	0·44	0·40	0·413
	Sulphur	0·053	0·079	0·065	0·057	0·068	0·071	0·048	0·0630
	Phosphorus	0·048	0·061	0·056	0·057	0·063	0·063	0·054	0·0577
	Manganese	0·54	0·56	0·57	0·58	0·56	0·56	0·53	0·551

Average of the whole ingot: C, 0·432; Si, 0·0704; P, 0·0626; Mn 0·552.
Analysis of ladle test: C, 0·43; S, 0·069; P, 0·062; Mn, 0·55.

TABLE C.—*Analyses made on an 18-inch by 22-inch by 67-inch Acid Steel Ingot. Heat D, 2086. Weight of Ingot, 6000 lbs.*

Ingot was top poured, with the addition of 4 oz. aluminium to the ton of steel, allowed to cool, and was then cut through the centre of the 18-inch side longitudinally. Drillings were taken from holes ½-inch diameter by ½-inch deep, on planed surface at intersection of lettered and numbered lines as shown on Fig. 1.

No.		A.	B.	C.	D.	E.	F.	G.	H.	I.	Average.
1	Carbon	0·39	0·35	0·31	0·33	0·32	0·32	0·31	0·39	0·41	0·348
	Sulphur	0·057	0·034	0·033	0·041	0·038	0·038	0·035	0·053	0·058	0·0430
	Phosphorus	0·054	0·038	0·034	0·036	0·035	0·039	0·037	0·052	0·053	0·0420
	Manganese	0·52	0·52	0·52	...	...	...	...	...	...	0·520
2	Carbon	0·39	0·41	0·36	0·31	0·35	0·36	0·39	0·42	0·42	0·379
	Sulphur	0·066	0·067	0·054	0·035	0·042	0·048	0·050	0·052	0·057	0·0536
	Phosphorus	0·057	0·056	0·045	0·035	0·040	0·045	0·048	0·055	0·053	0·482
	Manganese	0·52	0·51	0·53	...	...	...	...	...	...	0·520
3	Carbon	0·39	0·42	0·42	0·40	0·48	0·44	0·44	0·43	0·41	0·436
	Sulphur	0·065	0·062	0·071	0·062	0·078	0·068	0·068	0·063	0·052	0·0654
	Phosphorus	0·056	0·053	0·053	0·052	0·061	0·058	0·056	0·053	0·052	0·0549
	Manganese	0·51	0·52	0·52	...	...	...	...	...	...	0·517
4	Carbon	0·40	0·44	0·45	0·43	0·43	0·45	0·45	0·42	0·43	0·433
	Sulphur	0·066	0·068	0·056	0·074	0·086	0·068	0·070	0·064	0·058	0·0678
	Phosphorus	0·056	0·056	0·057	0·060	0·063	0·066	0·060	0·054	0·053	0·0583
	Manganese	0·52	0·53	0·52	...	...	...	...	...	...	0·523
5	Carbon	0·41	0·45	0·45	0·43	0·34	0·43	0·46	0·40	0·39	0·418
	Sulphur	0·068	0·069	0·076	0·069	0·081	0·070	0·073	0·062	0·053	0·0690
	Phosphorus	0·057	0·059	0·065	0·056	0·049	0·065	0·061	0·057	0·050	0·0598
	Manganese	0·53	0·53	0·53	...	...	...	...	...	...	0·530
6	Carbon	0·42	0·45	0·43	0·42	0·38	0·40	0·47	0·42	0·37	0·418
	Sulphur	0·066	0·070	0·072	0·066	0·059	0·065	0·078	0·064	0·050	0·0656
	Phosphorus	0·058	0·057	0·060	0·053	0·054	0·057	0·060	0·055	0·048	0·0556
	Manganese	0·53	0·53	0·52	...	...	...	...	...	...	0·527
7	Carbon	0·41	0·45	0·42	0·40	0·38	0·38	0·44	0·40	0·37	0·406
	Sulphur	0·064	0·067	0·068	0·051	0·067	0·62	0·066	0·059	0·059	0·0637
	Phosphorus	0·057	0·066	0·053	0·051	0·052	0·052	0·059	0·057	0·052	0·0543
	Manganese	0·52	0·52	0·53	...	...	...	...	...	...	0·523
8	Carbon	0·41	0·43	0·41	0·39	0·36	0·39	0·42	0·41	0·36	0·398
	Sulphur	0·068	0·065	0·064	0·074	0·057	0·061	0·064	0·063	0·053	0·0621
	Phosphorus	0·052	0·057	0·051	0·069	0·049	0·052	0·064	0·054	0·050	0·0529
	Manganese	0·52	0·52	0·52	...	...	...	...	...	...	0·520
9	Carbon	0·40	0·42	0·41	0·37	0·36	0·36	0·40	0·42	0·37	0·390
	Sulphur	0·068	0·068	0·062	0·057	0·053	0·057	0·055	0·064	0·043	0·0574
	Phosphorus	0·056	0·057	0·054	0·047	0·049	0·051	0·053	0·056	0·047	0·0522
	Manganese	0·53	0·53	0·52	...	...	...	...	...	...	0·527
10	Carbon	0·38	0·41	0·40	0·35	0·36	0·35	0·40	0·44	0·37	0·384
	Sulphur	0·056	0·069	0·061	0·056	0·056	0·056	0·056	0·064	0·046	0·0560
	Phosphorus	0·056	0·057	0·048	0·050	0·050	0·048	0·052	0·056	0·048	0·0517
	Manganese	0·52	0·52	0·51	...	...	...	...	...	...	0·517
11	Carbon	0·38	0·41	0·39	0·35	0·37	0·35	0·38	0·43	0·34	0·378
	Sulphur	0·060	0·057	0·061	0·053	0·057	0·058	0·056	0·065	0·039	0·0562
	Phosphorus	0·053	0·056	0·050	0·051	0·047	0·050	0·052	0·053	0·042	0·0504
	Manganese	0·52	0·52	0·52	...	...	...	...	...	...	0·520
12	Carbon	0·39	0·41	0·41	0·36	0·38	0·37	0·39	0·42	0·37	0·389
	Sulphur	0·065	0·064	0·063	0·056	0·056	0·062	0·059	0·063	0·043	0·0589
	Phosphorus	0·054	0·054	0·052	0·052	0·049	0·051	0·055	0·053	0·045	0·0517
	Manganese	0·53	0·52	0·52	...	...	...	...	...	...	0·523

Average of the whole ingot: C, 0·397; S, 0·0601; P, 0·0624; Mn, 0·522.
Analysis of ladle test ingot: C, 0·38; S, 0·061; P, 0·062; Mn, 0·52.

TABLE D.—*Analyses made on an 18-inch by 22-inch by 67-inch Acid Steel Ingot. Heat D, 2086. Weight of Ingot, 6000 lbs.*

Ingot was top poured without the addition of aluminium, allowed to cool, and was then cut through the centre on the 18-inch side longitudinally. Drillings were taken from holes ½-inch diameter by ½-inch deep, on planed surface at intersection of lettered and numbered lines as shown on Fig. 1.

No.		A.	B.	C.	D	E.	F	G.	H	I.	Average.
1	Carbon	0·33	0·49	0·29	0·33	0·41	0·28	0·29	0·24	0·32	0·332
	Sulphur	0·035	0·078	0·022	0·039	0·063	0·038	0·038	0·022	0·063	0·0469
	Phosphorus	0·047	0·070	0·032	0·045	0·051	0·033	0·031	0·029	0·053	0·0424
	Manganese	0·47	0·55	0·50	0·50	0·53	0·50	0·50	0·51	0·51	0·508
2	Carbon	0·32	0·39	0·41	0·47	0·39	0·55	0·46	0·35	0·32	0·430
	Sulphur	0·031	0·035	0·039	0·153	0·049	0·031	0·067	0·038	0·038	0·0598
	Phosphorus	0·034	0·045	0·044	0·169	0·052	0·029	0·061	0·043	0·036	0·0659
	Manganese	0·49	0·53	0·52	0·59	0·52	0·59	0·56	0·52	0·53	0·537
3	Carbon	0·31	0·37	0·54	0·70	0·35	0·62	0·54	0·39	0·23	0·530
	Sulphur	0·018	0·041	0·068	0·161	0·267	0·102	0·079	0·044	0·022	0·0901
	Phosphorus	0·030	0·046	0·038	0·135	0·197	0·095	0·072	0·047	0·028	0·0798
	Manganese	0·50	0·53	0·54	0·64	0·69	0·62	0·56	0·54	0·51	0·567
4	Carbon	0·32	0·42	0·55	0·54	0·59	0·54	0·59	0·39	0·32	0·495
	Sulphur	0·027	0·061	0·084	0·097	0·141	0·173	0·105	0·048	0·027	0·0849
	Phosphorus	0·036	0·057	0·075	0·086	0·109	0·112	0·080	0·049	0·035	0·0719
	Manganese	0·50	0·51	0·56	0·54	0·61	0·56	0·57	0·53	0·52	0·549
5	Carbon	0·35	0·41	0·46	0·45	0·47	0·54	0·48	0·40	0·36	0·436
	Sulphur	0·034	0·059	0·053	0·095	0·097	0·073	0·067	0·055	0·039	0·0628
	Phosphorus	0·040	0·062	0·055	0·069	0·083	0·072	0·060	0·048	0·042	0·0548
	Manganese	0·51	0·50	0·53	0·56	0·59	0·61	0·53	0·54	0·53	0·541
6	Carbon	0·37	0·39	0·43	0·40	0·46	0·39	0·42	0·41	0·42	0·408
	Sulphur	0·036	0·064	0·053	0·052	0·081	0·059	0·061	0·038	0·056	0·0567
	Phosphorus	0·046	0·060	0·052	0·052	0·063	0·051	0·053	0·041	0·051	0·0534
	Manganese	0·50	0·52	0·52	0·55	0·56	0·54	0·52	0·53	0·54	0·531
7	Carbon	0·38	b·46	0·41	0·37	0·46	0·38	0·39	0·42	0·41	0·409
	Sulphur	0·040	0·056	0·058	0·053	0·056	0·052	0·050	0·038	0·060	0·0501
	Phosphorus	0·048	0·062	0·052	0·052	0·061	0·054	0·049	0·055	0·063	0·0551
	Manganese	0·51	0·52	0·53	0·52	0·54	0·50	0·52	0·55	0·54	0·526
8	Carbon	0·38	0·45	0·39	0·36	0·38	0·37	0·39	0·42	0·40	0·393
	Sulphur	0·041	0·061	0·061	0·047	0·056	0·054	0·055	0·064	0·054	0·0537
	Phosphorus	0·046	0·055	0·053	0·050	0·053	0·048	0·051	0·055	0·052	0·0514
	Manganese	0·52	0·52	0·52	0·53	0·52	0·55	0·51	0·54	0·53	0·524
9	Carbon	0·36	0·45	0·44	0·36	0·35	0·39	0·42	0·42	0·39	0·398
	Sulphur	0·039	0·061	0·057	0·049	0·043	0·052	0·056	0·068	0·051	0·0531
	Phosphorus	0·044	0·059	0·056	0·049	0·045	0·048	0·053	0·059	0·049	0·0513
	Manganese	0·52	0·52	0·54	0·52	0·51	0·52	0·52	0·55	0·54	0·528
10	Carbon	0·38	0·46	0·40	0·37	0·38	0·36	0·40	0·41	0·40	0·394
	Sulphur	0·044	0·069	0·058	0·060	0·048	0·053	0·056	0·069	0·056	0·0547
	Phosphorus	0·046	0·059	0·053	0·050	0·047	0·049	0·049	0·056	0·050	0·0512
	Manganese	0·52	0·53	0·53	0·53	0·51	0·52	0·52	0·54	0·55	0·528
11	Carbon	0·41	0·41	0·37	0·33	0·34	0·35	0·38	0·39	0·37	0·372
	Sulphur	0·048	0·061	0·056	0·045	0·047	0·050	0·054	0·062	0·050	0·0515
	Phosphorus	0·048	0·053	0·050	0·045	0·043	0·046	0·049	0·053	0·054	0·0491
	Manganese	0·51	0·52	0·52	0·51	0·52	0·50	0·51	0·53	0·54	0·518
12	Carbon	0·43	0·39	0·39	0·36	0·39	0·36	0·40	0·41	0·38	0·387
	Sulphur	0·053	0·046	0·054	0·052	0·051	0·047	0·057	0·063	0·058	0·0537
	Phosphorus	0·054	0·048	0·053	0·053	0·050	0·048	0·052	0·053	0·050	0·0512
	Manganese	0·51	0·51	0·55	0·52	0·53	0·54	0·51	0·54	0·53	0·521

Average of the whole ingot: C, 0·416; S, 0·0697; P, 0·0655; Mn, 0·532.
Analysis of ladle test: C, 0·38; S, 0·061; P, 0·039; Mn, 0·52.

TABLE E.—*Analyses made on a 20-inch by 24-inch by 65-inch Basic Steel Ingot. Heat H, 187. Weight, 7500 lbs.*

Ingot was top poured, with the addition of 10 ozs. of aluminium to the ingot (inverted), allowed to cool, and was then cut through the centre of 20-inch side. Drillings were taken from holes ½-inch diameter by ½-inch deep on planed surface at intersection of lettered and numbered lines as shown on Fig. 1.

No.		A	B	C.	D.	E.	F.	G.	H.	I.	Average.
1	Carbon	0·46	0·52	0·43	0·45	0·43	0·43	0·46	0·45	0·44	0·462
	Sulphur	0·043	0·057	0·031	0·035	0·038	0·034	0·030	0·043	0·049	0·0391
	Phosphorus	0·032	0·038	0·035	0·029	0·023	0·025	0·025	0·033	0·033	0·0292
	Manganese	0·59	0·61	0·57	0·56	0·58	0·54	0·59	0·62	0·59	0·591
2	Carbon	0·44	0·52	0·75	0·63	0·61	0·69	0·71	0·51	0·44	0·589
	Sulphur	0·039	0·056	0·121	0·081	0·078	0·118	0·114	0·054	0·043	0·0784
	Phosphorus	0·039	0·039	0·072	0·046	0·046	0·060	0·060	0·034	0·029	0·0467
	Manganese	0·60	0·62	0·84	0·56	0·53	0·63	0·63	0·51	0·53	0·619
3	Carbon	0·50	0·53	0·58	0·56	0·55	0·52	0·58	0·53	0·45	0·533
	Sulphur	0·041	0·042	0·065	0·071	0·064	0·053	0·066	0·059	0·047	0·0576
	Phosphorus	0·031	0·032	0·052	0·044	0·036	0·040	0·045	0·038	0·031	0·0389
	Manganese	0·61	0·62	0·62	0·60	0·58	0·62	0·62	0·61	0·62	0·613
4	Carbon	0·47	0·53	0·59	0·52	0·53	0·52	0·58	0·53	0·49	0·529
	Sulphur	0·051	0·054	0·055	0·046	0·060	0·054	0·054	0·072	0·053	0·0610
	Phosphorus	0·035	0·036	0·046	0·042	0·036	0·039	0·044	0·041	0·036	0·0394
	Manganese	0·59	0·63	0·62	0·60	0·59	0·62	0·62	0·62	0·62	0·613
5	Carbon	0·49	0·55	0·56	0·57	0·53	0·57	0·57	0·52	0·49	0·539
	Sulphur	0·047	0·069	0·058	0·071	0·064	0·075	0·068	0·070	0·052	0·0639
	Phosphorus	0·036	0·039	0·043	0·046	0·041	0·044	0·045	0·039	0·035	0·0409
	Manganese	0·59	0·62	0·61	0·63	0·60	0·64	0·63	0·62	0·63	0·619
6	Carbon	0·57	0·57	0·55	0·61	0·61	0·57	0·56	0·55	0·47	0·561
	Sulphur	0·052	0·061	0·069	0·073	0·084	0·071	0·064	0·066	0·052	0·0658
	Phosphorus	0·034	0·038	0·039	0·034	0·048	0·033	0·042	0·039	0·035	0·0402
	Manganese	0·60	0·62	0·62	0·63	0·60	0·63	0·61	0·62	0·61	0·619
7	Carbon	0·46	0·59	0·58	0·62	0·66	0·56	0·55	0·53	0·49	0·568
	Sulphur	0·045	0·067	0·064	0·084	0·095	0·066	0·066	0·058	0·055	0·0680
	Phosphorus	0·033	0·040	0·040	0·047	0·050	0·043	0·044	0·039	0·038	0·0413
	Manganese	0·60	0·63	0·60	0·62	0·63	0·62	0·62	0·62	0·62	0·620
8	Carbon	0·48	0·60	0·56	0·56	0·60	0·54	0·56	0·56	0·46	0·563
	Sulphur	0·048	0·069	0·064	0·070	0·165	0·067	0·059	0·068	0·050	0·0734
	Phosphorus	0·035	0·040	0·035	0·041	0·092	0·042	0·041	0·040	0·035	0·0443
	Manganese	0·60	0·62	0·62	0·63	0·69	0·63	0·63	0·62	0·63	0·630
9	Carbon	0·48	0·58	0·56	0·52	0·59	0·53	0·54	0·54	0·47	0·532
	Sulphur	0·043	0·067	0·058	0·052	0·087	0·060	0·064	0·070	0·048	0·0621
	Phosphorus	0·029	0·040	0·041	0·035	0·048	0·037	0·042	0·044	0·030	0·0394
	Manganese	0·59	0·62	0·63	0·60	0·62	0·60	0·60	0·63	0·60	0·610
10	Carbon	0·47	0·55	0·51	0·51	0·51	0·50	0·50	0·52	0·43	0·500
	Sulphur	0·047	0·064	0·049	0·056	0·087	0·047	0·056	0·066	0·041	0·0538
	Phosphorus	0·031	0·039	0·031	0·037	0·038	0·033	0·037	0·043	0·027	0·0351
	Manganese	0·61	0·62	0·63	0·62	0·61	0·61	0·61	0·63	0·61	0·617
11	Carbon	0·47	0·53	0·50	0·51	0·77	0·55	0·49	0·52	0·45	0·532
	Sulphur	0·045	0·058	0·048	0·062	0·165	0·092	0·050	0·070	0·050	0·0711
	Phosphorus	0·028	0·038	0·032	0·036	0·095	0·054	0·031	0·043	0·031	0·0431
	Manganese	0·61	0·62	0·60	0·60	0·67	0·63	0·61	0·61	0·61	0·617
12	Carbon	0·46	0·50	0·50	0·50	0·47	0·47	0·46	0·48	0·51	0·483
	Sulphur	0·050	0·060	0·048	0·050	0·047	0·045	0·047	0·054	0·047	0·0487
	Phosphorus	0·029	0·030	0·033	0·033	0·034	0·035	0·041	0·035	0·034	0·0338
	Manganese	0·62	0·61	0·60	0·58	0·60	0·60	0·60	0·61	0·60	0·602

Average of the whole ingot: C, 0·530; S, 0·0619; P, 0·0393; Mn, 0·614.
Analysis of ladle test: C, 0·50; S, 0·062; P, 0·040; Mn, 0·62.

TABLE F.—*Analyses made on a 20-inch by 24-inch by 65-inch Basic Steel Ingot. Heat H, 187. Weight, 7500 lbs.*

Ingot was top poured, with the addition of 10 ozs. of aluminium to the ingot (in original position), allowed to cool, and was then cut through the centre of 20-inch side longitudinally. Drillings were taken from holes ½-inch deep on planed surface at intersection of lettered and numbered lines as shown on Fig. 1.

No.		A.	B.	C.	D.	E.	F.	G.	H.	I.	Average.
1	Carbon	0·44	0·43	0·44	0·45	0·47	0·47	0·45	0·44	0·49	0·453
	Sulphur	0·042	0·039	0·039	0·039	0·054	0·037	0·037	0·042	0·40	0·0420
	Phosphorus	0·054	0·040	0·036	0·036	0·030	0·036	0·035	0·030	0·037	0·0342
	Manganese	0·57	0·56	0·61	...	...	...	...	...	...	0·587
2	Carbon	0·50	0·49	0·49	0·48	0·51	0·51	0·51	0·53	0·50	0·498
	Sulphur	0·063	0·058	0·044	0·031	0·045	0·056	0·056	0·058	0·063	0·0549
	Phosphorus	0·041	0·040	0·033	0·031	0·030	0·037	0·030	0·036	0·040	0·0363
	Manganese	0·60	0·62	0·60	..	...	...	...	...	...	0·610
3	Carbon	0·51	0·51	0·53	0·55	0·54	0·50	0·52	0·55	0·52	0·549
	Sulphur	0·051	0·054	0·054	0·072	0·088	0·064	0·064	0·078	0·057	0·0724
	Phosphorus	0·042	0·043	0·041	0·045	0·050	0·052	0·041	0·043	0·043	0·0447
	Manganese	0·61	0·62	0·63	...	...	...	...	...	...	0·620
4	Carbon	0·52	0·52	0·54	0·59	0·75	0·55	0·55	0·56	0·51	0·566
	Sulphur	0·060	0·062	0·063	0·078	0·121	0·072	0·065	0·068	0·063	0·0724
	Phosphorus	0·038	0·041	0·041	0·043	0·060	0·045	0·043	0·044	0·041	0·0440
	Manganese	0·61	0·63	0·62	...	...	...	...	...	...	0·620
5	Carbon	0·52	0·51	0·54	0·58	0·70	0·54	0·55	0·53	0·51	0·553
	Sulphur	0·063	0·064	0·064	0·087	0·102	0·070	0·065	0·065	0·066	0·0699
	Phosphorus	0·042	0·041	0·041	0·045	0·055	0·041	0·042	0·040	0·039	0·430
	Manganese	0·63	0·62	0·63	..	...	...	...	...	...	0·627
6	Carbon	0·49	0·53	0·52	0·54	0·55	0·55	0·52	0·55	0·49	0·532
	Sulphur	0·054	0·064	0·064	0·068	0·081	0·075	0·064	0·064	0·060	0·0637
	Phosphorus	0·036	0·041	0·040	0·042	0·038	0·044	0·040	0·041	0·038	0·0400
	Manganese	0·62	0·62	0·62	...	...	...	...	...	...	0·620
7	Carbon	0·47	0·54	0·53	0·55	0·58	0·55	0·53	0·54	0·48	0·541
	Sulphur	0·049	0·066	0·056	0·067	0·081	0·068	0·063	0·067	0·049	0·0611
	Phosphorus	0·034	0·043	0·037	0·042	0·036	0·044	0·041	0·041	0·033	0·0388
	Manganese	0·61	0·63	0·62	...	...	...	...	...	...	0·620
8	Carbon	0·47	0·53	0·56	0·54	0·57	0·53	0·55	0·53	0·47	0·527
	Sulphur	0·046	0·055	0·058	0·068	0·083	0·068	0·060	0·063	0·045	0·0639
	Phosphorus	0·034	0·041	0·041	0·041	0·047	0·043	0·043	0·040	0·039	0·0396
	Manganese	0·62	0·62	0·62	...	...	...	...	...	...	0·623
9	Carbon	0·48	0·53	0·52	0·55	0·54	0·52	0·55	0·52	0·48	0·520
	Sulphur	0·045	0·064	0·064	0·085	0·075	0·063	0·070	0·067	0·044	0·0613
	Phosphorus	0·031	0·042	0·038	0·041	0·042	0·040	0·043	0·041	0·039	0·0386
	Manganese	0·61	0·63	0·62	...	...	...	...	...	...	0·620
10	Carbon	0·47	0·54	0·53	0·53	0·52	0·54	0·53	0·52	0·48	0·518
	Sulphur	0·039	0·060	0·052	0·051	0·063	0·060	0·064	0·065	0·049	0·0591
	Phosphorus	0·029	0·042	0·037	0·039	0·039	0·040	0·041	0·039	0·033	0·0373
	Manganese	0·61	0·61	0·63	...	...	...	...	...	...	0·617
11	Carbon	0·47	0·54	0·51	0·50	0·49	0·51	0·52	0·53	0·47	0·504
	Sulphur	0·044	0·065	0·061	0·055	0·054	0·052	0·059	0·059	0·045	0·0559
	Phosphorus	0·030	0·043	0·037	0·036	0·033	0·034	0·037	0·043	0·030	0·0359
	Manganese	0·62	0·62	0·62	...	...	...	...	...	...	0·620
12	Carbon	0·48	0·49	0·44	0·46	0·52	0·49	0·48	0·48	0·49	0·479
	Sulphur	0·044	0·048	0·043	0·043	0·059	0·050	0·055	0·054	0·043	0·0495
	Phosphorus	0·033	0·034	0·032	0·034	0·040	0·033	0·034	0·031	0·030	0·0334
	Manganese	0·62	0·63	0·61	...	...	...	...	...	...	0·620

Average of the whole ingot: C, 0·518; S, 0·0604; P, 0·0389; Mn, 0·617.
Analysis of ladle test: C, 0·50; S, 0·062; P, 0·040; Mn, 0·62.

TABLE G.—*Analyses made on a 20-inch by 24-inch by 66-inch Basic Steel Ingot. Heat F, 548. Weight, 7300 lbs.*

Ingot was top poured, with the addition of 10 ozs. of aluminium to the ingot, allowed to cool, and was then cut through the centre of the 20-inch side longitudinally. Drillings were taken from holes ½-inch diameter by ½-inch deep, on planed surface at intersection of lettered and numbered lines, as shown on Fig. 1.

No.		A.	B.	C.	D.	E.	F.	G.	H.	I.	Average.
1	Carbon	0·11	0·11	0·10	0·10	0·10	0·10	0·10	0·11	0·11	0·104
	Sulphur	0·064	0·054	0·056	0·047	0·012	0·043	0·041	0·055	0·057	0·0510
	Phosphorus	0·031	0·031	0·034	0·029	0·027	0·026	0·025	0·025	0·031	0·0288
	Manganese	0·49	0·50	0·49	0·48	0·49	0·49	0·48	0·49	0·49	0·490
2	Carbon	0·11	0·11	0·13	0·19	0·22	0·19	0·13	0·11	0·10	0·143
	Sulphur	0·069	0·063	0·091	0·069	0·191	0·141	0·079	0·065	0·055	0·1037
	Phosphorus	0·032	0·033	0·041	0·068	0·054	0·054	0·039	0·030	0·030	0·0412
	Manganese	0·50	0·51	0·50	0·50	0·51	0·53	0·49	0·50	0·48	0·502
3	Carbon	0·12	0·11	0·10	0·20	0·25	0·13	0·11	0·12	0·12	0·140
	Sulphur	0·072	0·062	0·060	0·170	0·241	0·079	0·065	0·063	0·058	0·1000
	Phosphorus	0·033	0·031	0·034	0·058	0·082	0·039	0·036	0·033	0·034	0·0422
	Manganese	0·50	0·50	0·49	0·50	0·53	0·49	0·49	0·50	0·50	0·500
4	Carbon	0·11	0·12	0·11	0·13	0·21	0·12	0·11	0·12	0·11	0·127
	Sulphur	0·057	0·076	0·071	0·089	0·192	0·069	0·067	0·066	0·063	0·0942
	Phosphorus	0·032	0·037	0·036	0·057	0·065	0·054	0·035	0·035	0·032	0·0481
	Manganese	0·49	0·50	0·50	0·50	0·49	0·49	0·50	0·49	0·49	0·498
5	Carbon	0·11	0·12	0·11	0·13	0·20	0·12	0·12	0·12	0·11	0·127
	Sulphur	0·062	0·078	0·072	0·074	0·178	0·066	0·073	0·075	0·065	0·0826
	Phosphorus	0·031	0·040	0·036	0·036	0·049	0·033	0·040	0·038	0·030	0·0370
	Manganese	0·50	0·51	0·50	0·50	0·52	0·50	0·50	0·49	0·50	0·502
6	Carbon	0·11	0·12	0·11	0·12	0·15	0·12	0·12	0·12	0·10	0·119
	Sulphur	0·060	0·079	0·075	0·065	0·098	0·069	0·060	0·081	0·055	0·0713
	Phosphorus	0·026	0·037	0·038	0·032	0·039	0·037	0·033	0·038	0·028	0·0341
	Manganese	0·50	0·50	0·50	0·49	0·51	0·49	0·49	0·50	0·49	0·497
7	Carbon	0·10	0·12	0·10	0·12	0·12	0·11	0·11	0·12	0·11	0·112
	Sulphur	0·056	0·079	0·066	0·064	0·061	0·064	0·062	0·062	0·062	0·0662
	Phosphorus	0·027	0·036	0·034	0·034	0·029	0·032	0·032	0·037	0·029	0·322
	Manganese	0·50	0·50	0·50	0·49	0·49	0·49	0·49	0·49	0·49	0·493
8	Carbon	0·10	0·12	0·11	0·11	0·11	0·10	0·11	0·12	0·10	0·109
	Sulphur	0·049	0·077	0·067	0·062	0·057	0·056	0·051	0·081	0·048	0·0620
	Phosphorus	0·025	0·035	0·034	0·031	0·026	0·029	0·035	0·038	0·030	0·0321
	Manganese	0·50	0·50	0·49	0·50	0·48	0·49	0·48	0·49	0·50	0·492
9	Carbon	0·10	0·12	0·11	0·11	0·10	0·11	0·11	0·12	0·10	0·109
	Sulphur	0·041	0·075	0·071	0·063	0·054	0·052	0·062	0·081	0·056	0·0628
	Phosphorus	0·022	0·036	0·032	0·030	0·029	0·033	0·031	0·037	0·025	0·0306
	Manganese	0·50	0·49	0·50	0·50	0·48	0·48	0·48	0·49	0·48	0·489
10	Carbon	0·10	0·11	0·10	0·11	0·10	0·11	0·12	0·10	0·10	0·107
	Sulphur	0·046	0·068	0·065	0·062	0·054	0·058	0·059	0·079	0·053	0·0601
	Phosphorus	0·030	0·035	0·034	0·029	0·028	0·032	0·029	0·041	0·027	0·0302
	Manganese	0·50	0·49	0·48	0·48	0·49	0·49	0·49	0·50	0·49	0·490
11	Carbon	0·10	0·11	0·11	0·11	0·10	0·10	0·11	0·12	0·10	0·107
	Sulphur	0·044	0·066	0·061	0·059	0·054	0·055	0·057	0·071	0·073	0·0600
	Phosphorus	0·022	0·034	0·029	0·031	0·029	0·031	0·029	0·036	0·031	0·0302
	Manganese	0·50	0·49	0·49	0·48	0·49	0·48	0·50	0·50	0·49	0·491
12	Carbon	0·09	0·10	0·09	0·10	0·10	0·11	0·10	0·10	0·09	0·098
	Sulphur	0·037	0·055	0·057	0·057	0·074	0·054	0·069	0·052	0·042	0·0557
	Phosphorus	0·022	0·030	0·030	0·030	0·031	0·033	0·033	0·037	0·022	0·0303
	Manganese	0·49	0·49	0·48	0·48	0·49	0·49	0·48	0·49	0·49	0·485

Average of the whole ingot: C, 0·117; S, 0·0739; P, 0·0339; Mn, 0·494.

ingot when cut through longitudinally, in which the percentage of sulphur has increased more than 25 percent above the sulphur shown by the ladle test. In the case of the ingot to which no aluminum was added, the doubly shaded portion represents the area in which the percentage of sulphur has increased more than 75 percent over the sulphur shown by the ladle test; no such area should be remembered that the drillings for analysis were taken at the points where the horizontal and vertical lines cross, and where the sulphur is above the limit; the area shaded has been taken half way between such point and the nearest point where the sulphur falls below such limit.

No comparative tests were made in the case of basic steel with and without the addition of aluminum. As it became the established custom at the works always to add a small amount of aluminum to all ingots, the author at the time did not consider it important to have this done, considering that the influence of a small amount of aluminum in decreasing the area of segregation had been already sufficiently proved.

In order to prove the importance of leaving the ingot

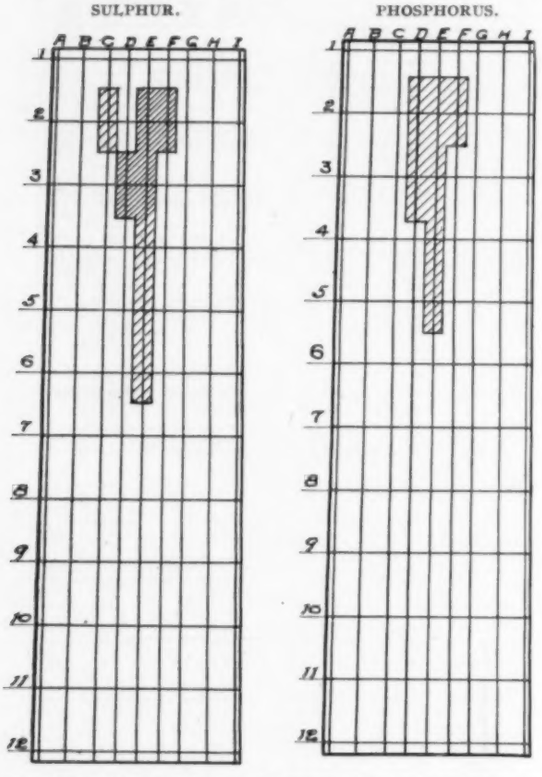


FIG. 4.—SEGREGATION OF SULPHUR AND PHOSPHORUS IN SAME INGOT.

Parts shaded show the areas in which sulphur or phosphorus has increased at least 25 per cent over ladle test.

always in a perfectly upright position, until time has been given sufficient to allow the center to solidify, an ingot was taken immediately after being cast, and whilst its center was still quite fluid, and inverted so that the base stood uppermost. After cooling in this position, the ingot was cut open, and analyzed, with the results shown in Table E. As was to be expected, the most segregated portion was here found in the end which had been allowed to cool uppermost; that is, the broad end of the ingot, although this was the original bottom end. The ingot from the same cast, which was not inverted, has, of course, the segregated area in the normal position, as is shown by the analyses given in Table F.

Another point to which attention should be drawn in the Tables E and F that is fairly high carbon basic steel, made from a phosphoric mixture, and in which the carbon has been raised from dead soft to about 0.5 percent, the percentage desired, is the regularity in the percentages of carbon, obtained by the addition of solid carbon to the steel whilst running into the ladle. Continental writers have several times lately questioned whether sufficient regularity can be obtained by this means, and the author would draw special attention to these analyses of carbon, as he considers they show the groundless nature of these statements. Tables I and K of the results obtained from billets from the same heat show also the same regularity in the carbon.

An examination of the foregoing results shows clearly that by the use of aluminum a billet of a much more regular composition is obtained. This is especially important in the case of carbon, especially if this steel had without aluminum been intended for rail purposes, as the surface of the rail would probably have shown considerable irregularities in the carbon percentage, with a consequent want of uniformity in its wearing properties.

In cases in which the carbon has segregated to the center, it is obvious that corresponding areas will be found at the sides in which the carbon is less than the mean, through the carbon having migrated to the center to a greater or less extent. This will be seen clearly if reference is made to the analyses given in Tables C and D.

As in cases in which aluminum has been added the segregation is lessened, the distribution of the carbon over the surface of the ingot is found to be much more even, and to approach more nearly to the composition given by the ladle test.

To trace the effect of segregation when the ingot is worked down into billets, and to show the influence of aluminum in lessening the effect of segregation when the steel is rolled into billets, the following test was made:—Two ingots from Heat No. D, 2,086, of which analyses of the ingot are given in Table C, were rolled into blooms. The ingots were 18 by 22 square, of acid open-hearth steel. The weight of each ingot being 6,000 lb., and the analyses of the ladle test of the heat being C, 38; S, 061; P, 052; Mn, 52 percent. Table H shows the results obtained. To the ingot marked A no aluminum was added, whilst to the ingot marked B ¾ lb. of aluminum was added. As the effect of the segregation is almost entirely confined to the top third of the ingot, only this portion was analyzed. Drillings were taken with a ¾-in. drill at the center of the billet and also at ¾ in. from the side, thus:

C.	S.
O	O

Although the results in Table H show that the influence of the aluminum did distinctly lessen the effects of segregation, as shown in the billet, still segregation could be very distinctly traced. Tests were also made in the same manner on billets rolled from steel made in the basic furnace, and in this case the effect of segregation seems considerably localized, and, as will be seen from Table I, it appears to a marked extent only in one spot; that is, in the center of the section taken between the second and third billet. The following are the particulars of this test. The ingot was 20 in. by 24 in. by 65 in., and was taken from Heat No. H, 187. Ingot was top poured and 10 ounces of aluminum were added to it in casting. After casting ingot was allowed to cool in its original position.

After cooling, the ingot was reheated and bloomed down to 6 in. by 6¼ in. After rolling to this size the ingot was cut up into small billets as follows: First, the

regular crop was cut off, then a small piece 6 in. long, then a billet 4 ft. 6 in. long, then another small piece 6 in. long, then another billet 4 ft. 6 in. long, and so on until the whole ingot was cut up and twelve small pieces each 6 inches long had been cut from the same. From these small pieces drillings were taken from the centers and sides and analyzed, with the results shown below.

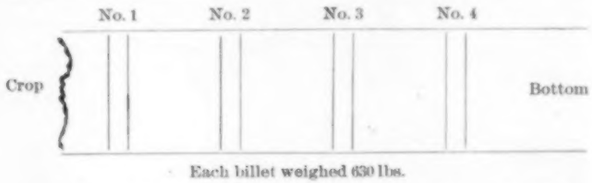
The center drillings were taken from holes ¾ in. diameter by 1 in. deep, while the side drillings were taken from holes ¾ in. diameter by ½ in. deep; the side drillings

TABLE H.—INGOT A. NO ALUMINUM

	Center			Side		
No.	Carbon	Sulphur	Phosphorus	Carbon	Sulphur	Phosphorus
1	0.28	0.037	0.029	0.29	0.042	0.036
2	0.60	0.143	0.119	0.36	0.052	0.049
3	0.54	0.125	0.094	0.31	0.053	0.038
4	0.37	0.076	0.056	0.34	0.063	0.054

INGOT B. ALUMINUM

1	0.34	0.074	0.050	0.39	0.064	0.061
2	0.53	0.120	0.088	0.38	0.066	0.062
3	0.42	0.083	0.062	0.40	0.067	0.058
4	0.40	0.072	0.058	0.39	0.066	0.057



Each billet weighed 630 lbs.

were taken from a point about ¾ in. from the ends of the piece.

Piece No. 1 was taken from the top end of ingot, and No. 12 was taken from the bottom end.

TABLE I.

	Center				Side			
No.	Carbon	Sulphur	Phos.	Mn.	Carbon	Sulphur	Phos.	Mn.
1	0.54	0.053	0.038	0.61	0.53	0.054	0.035	0.60
2	0.58	0.078	0.036	0.63	0.49	0.051	0.034	0.60
3	0.71	0.135	0.065	0.57	0.54	0.056	0.035	0.64
4	0.55	0.058	0.036	0.64	0.54	0.058	0.034	0.63
5	0.53	0.064	0.036	0.64	0.52	0.062	0.036	0.63
6	0.52	0.064	0.034	0.60	0.51	0.062	0.036	0.61
7	0.51	0.068	0.041	0.59	0.51	0.062	0.038	0.60
8	0.53	0.057	0.035	0.62	0.52	0.059	0.039	0.62
9	0.51	0.062	0.039	0.62	0.51	0.064	0.040	0.61
10	0.52	0.069	0.039	0.61	0.53	0.066	0.039	0.63
11	0.52	0.054	0.035	0.61	0.53	0.056	0.036	0.63
12	0.52	0.049	0.036	0.61	0.50	0.044	0.040	0.59
Average	0.545	0.0674	0.0391	0.620	0.518	0.0578	0.0368	0.616
Total av.	0.531	0.0626	0.0379	0.618	....	....	...	....
Ladle test	0.50	0.062	0.040	0.62	....	....	....	....

Another ingot from the same heat, and to which the same amount of aluminum was added, was inverted after casting and allowed to cool in this position. After reheating the ingot was bloomed down to 6 in. by 6¼ in., and 6-in. pieces and 4-ft. 6-in. billets cut off as before. In this case, of course, segregation was to be expected in the billets from the lower third of the ingot. Here, again, we find the excessive segregation is strictly localized, being found only in center of No. 11. (See Table K.)

So far as the author is aware, Pourcel was the first to point out that the addition of aluminum gives homogeneity to the steel. The analyses given in the tables certainly tend to confirm this view. The reason why this should be so seems somewhat obscure, and the author does not wish to put forward any view on the subject by way of explanation, but the following considerations may serve to throw some light on the question.

His experience on the addition of aluminum in the ingot mold during casting has always been that the aluminum appears to make the metal set quicker. This, he is aware, is against the view usually held by metallurgists. Thus, in Mr. Harbord's recently published book on steel, it is stated: "The addition of very small amounts of metallic aluminum to such metal" (i. e. metal containing dissolved oxides) "is found to cause a marked increase in the fluidity of the molten metal, to stop evolution of gas, and to allow of the production of sound ingots without blowholes." Mr. Harbord, however, does not seem entirely satisfied with this view, as on the same page, in referring to Mr. Hadfield's classic work on aluminum steel, he tells us that, according to that investigator, it is doubtful whether aluminum increases the fluidity of properly made steel. This latter view falls in with the facts ob-

TABLE K.

	Center.				Side.			
No.	Carbon	Sulphur	Phos.	Mn.	Carbon	Sulphur	Phos.	Mn.
1	0.50	0.053	0.037	0.63	0.60	0.080	0.048	0.62
2	0.49	0.057	0.037	0.62	0.51	0.058	0.035	0.63
3	0.54	0.055	0.032	0.61	0.52	0.046	0.030	0.63
4	0.52	0.051	0.029	0.60	0.50	0.050	0.035	0.59
5	0.53	0.057	0.036	0.63	0.53	0.052	0.031	0.63
6	0.55	0.056	0.039	0.60	0.55	0.053	0.039	0.61
7	0.53	0.061	0.043	0.65	0.53	0.060	0.039	0.62
8	0.56	0.063	0.039	0.62	0.53	0.054	0.031	0.64
9	0.63	0.087	0.051	0.62	0.53	0.052	0.034	0.64
10	0.52	0.059	0.041	0.63	0.51	0.056	0.037	0.61
11	0.61	0.110	0.064	0.65	0.53	0.057	0.039	0.64
12	0.54	0.062	0.037	0.65	0.53	0.054	0.038	0.63
Average	0.543	0.0642	0.0404	0.626	0.531	0.0560	0.0363	0.624
Total ave.	0.537	0.0601	0.0383	0.625	..	..	..	..
Ladle test	0.50	0.062	0.040	0.62	..	..	..	..

served by the author, under whose directions aluminum has been added regularly to many thousands of casts.

Not only does the addition of a little aluminum to the metal as it is run into the ingot have a marked effect in setting the surface, but it also, in the author's experience, tends, when added above a certain quantity, to form cavities in the upper part of the ingot, so that the amount added has to be strictly regulated. The setting effect on the top of the ingot is so marked that at the works with which the author was connected, after it had become the custom to add aluminum regularly, the ingots were never sanded over or stoppered down, as no such treatment was necessary, ether with acid or basic open-hearth steel. With mild steel also it was found that the molds could be stripped sooner when aluminum had been added.

It was also observed that when the same quantity of aluminum—viz., some 3 to 4 oz. per ton of steel—was added to the metal as it ran into the ladle, its effect was not so pronounced as when added in the ingot mold as the ingot was being teemed.

There appears, therefore, to be somewhat of a contradiction in the facts observed, some authorities telling us that aluminum in small quantities increases the fluidity of the metal; others, with whom the author joins, contending that the reverse is the case. Theoretically, one would undoubtedly expect some increase in temperature,

owing to the reaction between the dissolved oxides in the metal and the aluminum, an action akin to the well-known thermite process.

If an increased temperature is obtained, with the consequent increased fluidity, this would cause the steel to take longer to solidify, and would consequently tend to increase the segregation, provided that the aluminum has no special action of its own on the metal, whereas the numerous analyses made by the author prove that there is a considerable diminution in the amount of segregation. As the metal appears to set quicker, and as, consequently, segregation would be expected to be less, due to this quicker setting, the analyses seem to agree with this view. The author's usual practice was to add about 3 to 4 oz. of aluminum per ton of steel in the ingot, but this was never added until the ingot mold was approximately two-thirds full. Assuming the aluminum to be all concentrated in this top third of the ingot, it would then only be at the rate of about 12 oz. per ton, or about 0.033 percent aluminum.

In the author's opinion it would be well worth while for other investigators, interested in the manufacture of higher carbon steel, such as for rail, tire and similar purposes, to follow up these results, with a view of proving whether a more uniform and regular steel is not thereby obtained, a result well worth the few pence per ton the aluminum would cost. Perhaps the chief result to be looked for would be the decreased amount of crop end that it would be necessary to cut off from the top of the ingot, due to the greater solidity of the top and the lessened amount of segregation in this top part of the ingot. This alone would undoubtedly pay for the cost of the aluminum added, without considering the more regular quality of the finished product as a whole.

MACHINERY NEEDED AT CANAL.

(Special Correspondence.)

WASHINGTON, Oct. 25.—The Panama Canal Commission will in the near future advertise for bids for considerable quantities of equipment and supplies. Among the items for which proposals will be invited are machine tools for the Bas Matachin shops. These will include machine screw caps, short shank dies hob right hand, long taper dies hob right hand, right hand pipe hob, left hand pipe hob, short shank die hob right hand 12 V thread, long taper die tap right hand 12 V thread, Sellers hob left hand, short shank die hob left hand, long taper die tap left hand, solid dies right hand, thread gauges external and internal hardened and gound in angle of thread set to compromise various sizes, six threading tools, each tool with full set straight, single and double offset cutters for all threads and full set of chasers for all threads, 4 to 20 pitch; one Rhodes square threading tool with full set of cutters, right and left hand thread; six No. 3 Johnson cutting off tools with 3-32-in. blades, six No. 4 Johnson cutting off tools 3-32-in. blades, 25 blades, assorted widths, for No. 3 Johnson cutting off tool; 25 blades for No. 4 Johnson cutting off tool, 40 steel sockets, various styles, with shank fitted to various size sockets, and one knurling tool with two sets each fine, medium and coarse knurls.

Another extensive list of equipment items for which the canal officials will in the near future invite bids, embodies machinery for a planing mill, and includes one blind wirer, one feed knife grinder, one emery wheel stand, one 36-in. grindstone and frame, one 30-in. cylinder planer and matcher, one 24-in. surface planing machine one sash sticker, one woodworker and molder, one tenoning machine, one 38-in. wheel band saw, one automatic saw setting machine, one rip saw, one saw and dado machine, one hand feeding sand papering machine, one 20-in. swing lathe with movable carriage and tool post, one sash door and blind champing machine.

AN ELEVATOR FOR RAISING ZINC ORE.

The accompanying illustration shows an elevator built by the C. O. Bartlett & Snow Co., Cleveland, O., for the Underwriters' Land Co., of Carthage, Mo. The elevator is used for elevating zinc ore from their mines. It is 300 ft. between centers, 260 ft. of which extends below the ground. The lower end is at the level of the mine floor. The machine has a capacity of 500 tons per day of 10 hours.

The elevator is operated without any attendant. The ore is dumped into the hopper near the bottom of the elevator from standard mine cars and is automatically fed to the buckets. After being elevated it is discharged into crusher bins at the head. The buckets are of the overlapping type, are 24 in. long, and are made of malleable iron. They are carried by two strands of drop forged steel chain with 1½-in. steel axles, to which are fastened

ELEVATOR FOR RAISING ZINC ORE.

chilled, dust-proof, oil-chambered, track wheels 6 in. in diameter, running on heavy T rails. The chains run over 48-in. sprockets at the top and bottom of the elevator, the chains being placed 21½ in. centers.

The elevator is driven by a 30-h. p., 720 revolutions per minute alternating current motor, which motor is geared to the head wheel of the elevator by double reduction gearing. It may be disconnected from the elevator by means of a friction clutch located on the first countershaft. The elvator is provided with an automatic safety brake, which prevents it from running backward in case the power is cut off. The cost of elevating ore by this system is less than ½ cent per ton.

The automatic feeder used in connection with the elevator is in the form of a pan, which entirely covers the bottom of the hopper. This is mounted on four wheels and axles of the same size as are used for the buckets. The pan is operated by means of a crank located on an unmounted shaft, which is driven through a chain and sprocket wheels from the shaft to the elevator. As each

bucket passes under the pan it moves forward a certain distance and is then drawn back, which allows a certain amount of ore to be deposited directly into the bucket. The movement of the pan can be varied to suit the requirements by changing the length of the throw of the crank so that the feeder will feed anywhere from nothing to 100 tons per hour.

THE ASSOCIATION OF RAILWAY SUPERINTENDENTS OF BRIDGES AND BUILDINGS.

The Association of Railway Superintendents of Bridges and Buildings held its annual convention at Pittsburg, Oct. 17 to 21, 1905. Business sessions were held the morning and afternoon of Oct. 17, the morning of Oct. 18 and the morning of Oct. 19. On the afternoons of Oct. 18 and 19, and on Oct. 20 and 21 excursions to various points were taken. The papers presented at the meetings consisted of the reports of committees to which had been assigned various subjects. Some of these subjects were: The Construction and Maintenance of Docks and Wharves, The Relative Value of Concrete and Timber Piles, Concrete Building Construction including Platforms, Protection of Water Tanks and Water Pipes from Frost, Recent Practice in Coffer Dam Work, Pile and Frame Trestle Bridges, Steel Bridges, Buildings, Fire Protection, Preservatives for Wood and Metal, Coaling Stations and Cinder Pits, and Records and Accounts. Officers were elected for the ensuing year as follows:

President—J. V. Sheldon, N. Y. N. H. & H. railway, Providence, R. I.

First Vice President—J. H. Markley, Toledo, Peoria & Wisconsin railroad, Peoria, Ill.

Second Vice President—R. H. Reed, L. S. & M. S. railway, Cleveland, Ohio.

Third Vice President—R. C. Sattley, Chicago & Northwestern railway, Chicago, Ill.

Fourth Vice President—J. P. Canty, Boston & Maine railway, Fitchburg, Mass.

Secretary—S. F. Patterson, Boston & Maine railway, Concord, Mass.

Treasurer—C. P. Austen, Boston & Maine railway, Medford, Mass.

Executive Members:

H. Rettinghouse, Wis. Central railway, Fond du Lac, Wis.
J. S. Lemond, Southern railway, Atlanta, Ga.
C. W. Richey, Pennsylvania railroad, Allegheny, Pa.
A. E. Kellam, Intercolonial railway, Moncton, N. B.
H. H. Eggleston, Central Indiana railway, Anderson, Ind.
W. F. Steffins, N. Y. C. & H. R. railroad, New York city.

The excursions comprised a belt line trolley trip around Pittsburg, a trip to the Pittsburg & Lake Erie shops at McKeesport, a steamboat ride on the Allegheny and Monongahela rivers, a belt line trip of 25 miles on the Pennsylvania lines, stops being made for the inspection of the Bessemer rail mill of the U. S. Steel Corporation at Braddock; the shops of the Westinghouse Electric & Mfg. Co. at East Pittsburg. On Saturday a trip was taken over the Pittsburg, Ft. Wayne & Chicago railway to inspect the American Bridge Co.'s plant at Ambridge, Pa.

The meeting was a large one, there being nearly 300 members present.

The practice in this country is to give directors of large corporations a fee for attending meetings. This serves as an inducement though it is not large enough to be regarded as compensation. The practice in England is somewhat different and an increasing number of corporations pay not only a nominal fee, but distribute a portion of the earnings among them, after a fair dividend has been assigned to the shareholders.—[Banker & Stockholder.

STANDARD SPECIFICATIONS FOR STEEL CASTINGS.*

Process of Manufacture and Chemical Properties.

1. Steel for castings may be made by the open-hearth crucible or Bessemer process. Castings to be annealed unless otherwise specified.

2. Ordinary castings, those in which no physical requirements are specified, shall not contain over 0.40 percent of carbon, nor over 0.08 percent of phosphorus.

3. Castings which are subjected to physical test shall not contain over 0.05 percent of phosphorus, nor over 0.05 percent of sulphur.

Tensile Tests.

4. Tested castings shall be of three classes: "Hard," "Medium" and "Soft." The minimum physical qualities required in each class shall be as follows:

	Hard castings	Medium castings	Soft castings
Tensile strength, pounds per square inch	85,000	70,000	60,000
Yield point, pounds per square inch	38,250	31,500	27,000
Elongation, percent in two inches	15	18	22
Contraction of area, percent	20	25	30

Drop Test.

5. A test to destruction may be substituted for the tensile test, in the case of small or unimportant castings, by selecting three castings from a lot. This test shall show the material to be ductile and free from injurious defects, and suitable for the purposes intended. A lot shall consist of all castings from the same melt or blow, annealed in the same furnace charge.

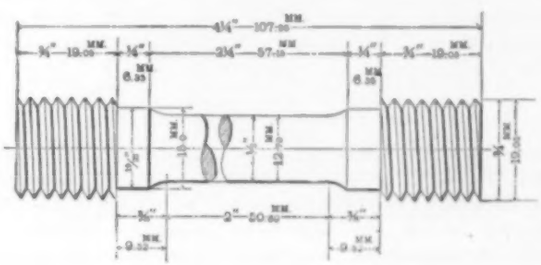
Percussive and Bending Tests.

6. Large castings are to be suspended and hammered all over. No cracks, flaws, defects, nor weakness shall appear after such treatment.

7. A specimen one inch by one-half inch (1″ x ½″) shall bend cold around a diameter of one inch (1″) without fracture on outside of bent portion, through an angle of 120° for "Soft" castings, of 90° for "Medium" castings.

Test Piece for Tensile Test.

8. The standard turned test specimen, one-half inch (½″) in diameter and two inch (2″) gauged length, shall be used to determine the physical properties specified in



TEST-PIECE.

paragraph No. 4. It is shown in the accompanying sketch.

Number and Location of Specimens.

9. The number of standard test specimens shall depend upon the character and importance of the castings. A test piece shall be cut cold from a coupon to be molded and cast on some portion of one or more castings from each melt or blow or from the sink-heads (in case heads

* As adopted by the American Society for Testing Materials.

of sufficient size are used). The coupon or sink-head must receive the same treatment as the casting or castings, before the specimen is cut out, and before the coupon or sink-head is removed from the casting.

Test Piece for Bending.

10. One specimen for bending test one inch by one-half inch (1" x ½") shall be cut cold from the coupon or sink-head of the casting or castings as specified in paragraph No. 9. The bending test may be made by pressure, or by blows.

Yield Point.

11. The yield point specified in paragraph No. 4 shall be determined by the careful observation of the drop of the beam or halt in the gauge of the testing machine.

Sample for Chemical Analysis.

12. Turnings from the tensile specimen, drillings from the bending specimen, or drillings from the small test ingot, if preferred by the inspector, shall be used to determine whether or not the steel is within the limits in phosphorus and sulphur specified in paragraphs Nos. 2 and 3.

Finish.

13. Castings shall be true to pattern, free from blemishes, flaws or shrinkage cracks. Bearing surfaces shall be solid, and no porosity shall be allowed in positions where the resistance and value of the casting for the purpose intended, will be seriously affected thereby.

Inspection.

14. The inspector representing the purchaser, shall have all reasonable facilities afforded to him by the manufacturer to satisfy him that the finished material is furnished in accordance with these specifications. All tests and inspections shall be made at the place of manufacture, prior to shipment.

Last Issue of "Air Power."

Air Power, a quarterly trade journal, issued by the Rand Drill Co., will with the October issue be discontinued for business reasons. This quarterly was 7 x 10 in. in size and consisted usually of about 16 pages. It was devoted to the applications of compressed air to industrial works. The October issue comprises articles on the application of compressed air in railway work; a description of the Center Star mine in British Columbia; an article on the water supply of the city of Savannah, which uses an air lift system; the new compressor plant at the Corra mine, Butte, Mont.; and an article reprinted from *Mines and Minerals*, entitled "Air Required to Operate Rock Drills." While the magazine was a trade journal, it contained valuable information relating to compressed air, and its discontinuance is a cause for regret.

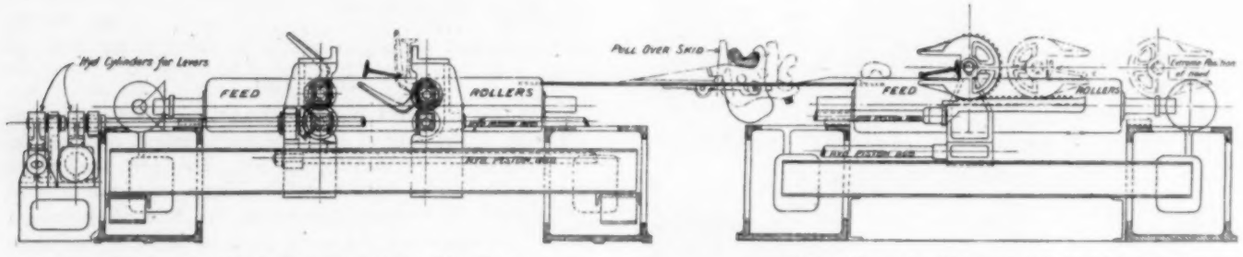
A MANIPULATOR FOR STEEL BARS.*

BY DOUGLAS UPTON.

The constantly increasing sizes of sectional material demanded by shipbuilders and engineers have forced makers of sections to consider the adoption of mechanical means of handling bars during the process of manufacture. In a mill rolling a great variety of sections the problem is one of extreme difficulty, as, owing to the various motions required, any single apparatus capable of doing all that is required in such a mill would be of an extremely complicated nature, so much so indeed as to impair its usefulness owing to the probability of breakdown and the constant attention which would be required to keep it in anything like order.

In the invention about to be described very briefly, this difficulty has, it is claimed, been overcome by employing a series of three machines, the first of which consists of two pairs of movable heads which are installed at each side of the roughing and finishing rolls. These heads can move in either direction parallel to the rolls. They are, preferably, actuated by hydraulic cylinders, and they place the piece in position for entering any required pass. These heads, moreover, are fitted with levers for turning the piece up for edging purposes: not only will they turn the piece up, but without actually gripping it, will maintain it in that position until it enters the rolls. The heads are shown at A.

A. B. C.



Cross Section of Feed Roller Gear at Roughing Rolls. Cross Section of Feed Roller Gear at Finishing Rolls.

A MANIPULATOR FOR STEEL BARS.

In addition to edging, however, nearly all the larger sizes require to be turned completely over once, or oftener, during the process of rolling. The rolls employed are so designed, however, that the first turn over does not take place until the bar has left the roughing rolls and before it enters the finishing. The second of the three machines has been correspondingly designed, therefore, to do this turning over of the piece between the roughing and finishing rolls. B indicates how this result is obtained. It will be seen that as the bar is being pushed over from the roughing to the finishing rolls it is caused to move up a slight incline until the outer edge of the bar is engaged by what may be termed the hook of a tumbler. As the bar is pushed farther forward this tumbler rotates, and finally the piece, of whatever shape, is turned completely over, ready for entering the first pass of the finishing rolls. In point of fact, the time occupied in this double operation of skidding and turning over the piece is not longer than that usually occupied in merely skidding the piece across according to the old method. Hence the time formerly occupied in turning over the piece by hand for entering the finishing rolls is saved altogether.

When rolling sections such as large bulb tees, it is necessary to turn the bar completely over at each side of

*A paper presented at the meeting of the Iron & Steel Institute, Sheffield, England, Sept. 26-29, 1905

the finishing rolls, and for this purpose the machine (C) has been designed. It consists, briefly, of a head capable of being moved in either direction parallel to the rolls. This head carries a segmental body provided with teeth which engage with a rack so that partial rotation of the body about a horizontal axis at right angles to the rolls can be obtained in any position of the head. The turning over of the bar is performed by moving the head so that the segmental body engages the bar which it holds in position without gripping. On rotating the body by means of the rack the bar can be turned completely over and at the same time brought directly opposite the next pass in the rolls—the whole operation only occupying a fraction of the time previously required with manual labor.

So far as experience goes, these appliances have been found to answer all the purposes required in the large mill in which they have been used. They have reduced the rolling staff from ten men, on ordinary sections, to five, and on some of the larger sections even greater reductions in the number of men have been effected. Beyond watching the guards and guides of the mill generally, the men whose services have been retained have very little to do, and the hard, laborious work which they had to perform at times is now done in a fraction of the time by the machines described. The output of all classes of sections has been increased very considerably, the material being finished so much hotter, much less steam is required to drive the mill, and there are no cobbles due to delay in handling heavy sections. There is less dressing of rolls; and, as to the life of the rolls, it may be mentioned that before this manipulating arrangement was designed, the breakage of bulb tee rolls was very heavy, averaging about one roll to every 400 tons manufactured. Since starting the manipulators some thousands of tons of bulb tees have been rolled, and not a single roll has been broken. This is a matter of great interest to all makers of sections; especially those who manufacture the larger and more awkward sizes, and a model is shown which fully illustrates the machinery and all that it is capable of doing.

A New Basis for Labor Unions.

"Instead of the principle of monopoly of competitors, I offer the principle of productivity, as a basis on which the action of unions should be founded," says J. Laurence Laughlin in an article on "The Hope for Labor Unions," in the November *Scribner's*. "By productivity is meant the practical ability to add to the product turned out in any industry. The productivity of labor operates on its price just as does utility on the price of any staple article—improve the quality of it and you increase the demand for it. This general truth is nothing new. The purchaser of a horse will pay more for a good horse than for a poor one. A coat made of good material will sell for more than one made of poor material. Why? Because it yields more utility, or satisfaction, to the purchaser. In the same way, if the utility of the labor to the employer is increased, it will be more desired; that is, if the laborer yields more of that for which the employer hires labor, the employer will pay more for it, on purely commercial grounds.

"Now it happens that where productivity is low—that is, where men are generally unskilled—the supply is quite beyond the demand for that kind of labor. Productivity being given, supply regulates the price. Obviously, to escape from the thralldom of an oversupply of labor in any given class, or occupation, the laborer must improve his productivity. That is another way of saying that if he trains himself and acquires skill, he moves up into a higher and less crowded class of labor. The effect on wages is twofold: (1) he is now in a group where the supply is relatively less to demand than before; and (2) his utility as a laborer to the employer is greater, and acts to increase the demand for his services. Productivity, therefore, is the one sure method of escape from the depressing effects on wages of an oversupply of labor."

DISPOSITION OF EXHAUST STEAM FROM MINE PUMPS.

The disposition of exhaust steam from pumping machinery in mines is a worthy subject for serious consideration. The use of long pipes to carry off the exhaust is costly and very inconvenient at times, owing to the frequent necessity for changing positions of the pumps in the various parts of the shaft. In mining operations large bodies of water are frequently encountered, making it necessary to have a pump that can be readily moved about, and raised and lowered in the shaft in the least possible time. A feasible plan of disposing of exhaust steam is a simple and inexpensive method of steam condensation provided by the A. S. Cameron Steam Pump Works, New York, and very often used in connection with their well-known "mine sinking pump." The accompanying illustrations and descriptions fully explain their system.

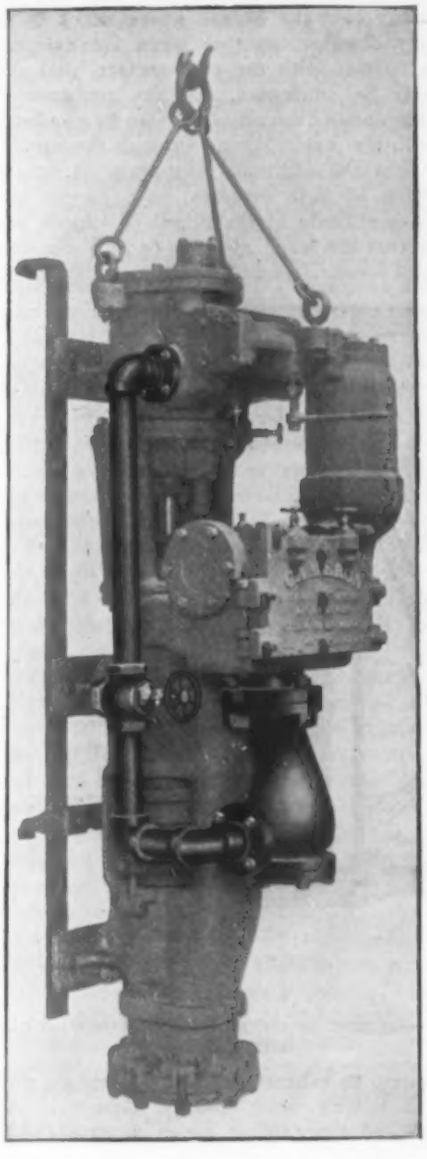


FIG. 1.—CAMERON PLUNGER SINKING PUMP.

The illustration, Fig. 1, shows one of the Cameron vertical plunger sinking pumps, having the slings attached by which it is hung in the shaft. The darker portion of

this reproduction shows the condenser, together with the exhaust pipe leading thereto, and directly bolted to the water valve chest; which makes a very compact arrangement without causing any resistance to the free inflow of water, while at the same time it is exceedingly effective in taking care of the exhaust steam by condensing it, and permitting it to enter the pump, as water, through the suction opening, from which it is discharged to the surface. In Fig. 2, a sectional view of the condenser chamber is shown which clearly defines the simple method of condensation. The constant flow of water through the suction piping connected to the bottom of the condenser will naturally cool the bronze sleeve which is arranged within this chamber, so that when the exhaust steam comes in contact with the cool surface, part of it will immediately be condensed, and the remainder passing through the annular opening, will also be condensed after mixing with the water passing through the suction.

It also has the additional advantage of relieving the steam piston of back pressure, as a partial vacuum is formed proportionate to the height of suction lift. It is necessary that the water cylinder be fully charged before the exhaust steam is turned into the condenser, by allowing the pump to exhaust into the atmosphere until it has become filled with water, then a three-way valve may be turned and the exhaust steam admitted to the condenser. In some cases automatic floats are arranged to stop the pumps when the water supply is down. An air leak is fatal to the successful working of this as of any other condensing apparatus, and therefore must be guarded against.

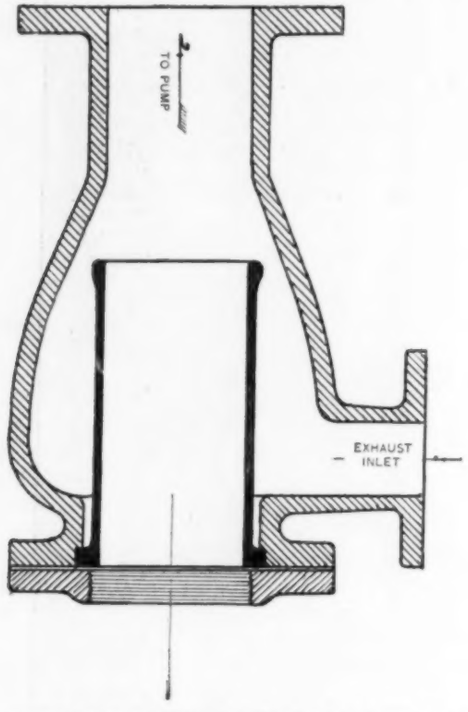


FIG. 2.—SECTION OF CONDENSER CHAMBER OF CAMERON SINKING PUMP.

There is good economy in the use of this type of condenser, which will vary owing to the existing conditions, besides disposing of the inconvenience of the higher temperature in the mines from the heat in the pipes delivering the exhaust steam to the surface. In addition to the saving of steam, the saving of the cost of the piping for carrying off the exhaust will oftentimes exceed the original cost of the condenser.

MACHINE SHOP FLOORS.

In the October issue of *Woodcraft* appeared an article on the subject of machine shop floors, which contained the ideas of a number of prominent engineers. We reprint the article below:

The floor of a machine shop comes in for rough usage. Heavy loads rest upon it and now and then are dragged to and fro with little heed to the integrity of the floor surface. Massive machines are pried up with bars and rolled on short lengths of pipe from one location to another, the pinch bars leaving in the wake of the sluggishly-moving machine a plainly marked out path.

The shop crane should be applied somewhere over the center of gravity but rarely does it strike the spot with accuracy and the weight first rises at one end—the other trailing tardily along in its turn until the lowest point clears the ground. Of course the distance is not long as a general thing, but the base of the machine may be far from smooth and even if it is machined the corner scraping the floor is none the less sharply cutting on that account. The same consideration applies when the crane man deposits a load on the ground. The lack of care in attaching the hook is likely to cause trouble when the machine bed strikes the floor, the corner coming in contact first much more frequently than the flat surface.

Then there is the fastening of machines to floors with lag and other screws. Textile machinery, for instance, is in long lengths which must be carefully aligned and for obvious reasons this alignment is maintained as accurately and positively as the construction of the building will permit. The level, plumb and line are freely employed, the machinery frames are adjusted to height with shingle packing strips or elevating screws and then each element is firmly attached by bolts or screws to the floor of the erecting shop. The finished machine is divided into conveniently handled sections. These are separated, then they are lifted and bolted to skids, lifted anew when they are raised to get the rolls under them or they are swung off the floor with the crane and transported without the rolls.

Heavier machinery stands securely with little or no fastening to the floor, but often enough there is staging galore built around the castings for the better access of the erectors. And so it goes with the rest of machine shop products. Weight and wagons, gum and grit, chips and castings, metal of all temperatures, emery, oil and sundry other things are put onto the floor a-plenty and wear their way deeply with the years. Every kind of carelessness goes with the wood of floors and benches. All things considered, they stand up to the work very well because the severity of the demands is usually recognized and they are given a fair start with good materials and therefore are capable of stout resistance to the future inflictions.

Nevertheless the old query still comes up for discussion relative to the survival of the fittest. The circulation of this experience leads to a better acquaintance with the actual conditions of the shops and incidentally it tends to eliminate the unfit. It is a matter of great importance to start right and in putting down the floor of a machine shop the better the beginning the more satisfactory the results in every department.

A mechanic of wide acquaintance among the machine woodworkers has recently emphasized this point. He said, "The man with his eyes open in this business is likely to learn from others. I remember a furniture manufacturer with whom I had some dealings. He was no engineer, but he had notions about mechanical matters that

were apt to come out straight as a string. Some of his machines were purchased from my firm; we were well acquainted, therefore, and occasionally his schemes were broached to me for criticism. One day he told me that he would have a line of shafting mounted on the ground floor. He would carry piers up from earth to bearings and it would be lined up and leveled once and forever. I now know something about machinery and I thought I knew it then. I chortled a trifle at any man looking so far ahead, confidently counting his chickens before they were hatched, when first the eggs were laid with the supervision of the ordinary millwright.

"But he had another card up his sleeve and dealt it out. He wanted the bearings to be minus any means of adjustment. They were to be set solidly in place for keeps. No adjusting screws, collars or anything else as a continued temptation to possible improvement and of dead sure meddling.

"He got the goods. The shaft was put in as per order. A young surveyor, just foot-loose from technical school, was called in with his transit. He put a scientific touch to the task of the millwright. Seven years later he was called again and took another squint along that line of shafting. Claimed he could find no change in excess of a sixteenth of an inch in the entire distance. One end was slightly lower than the other but the line was straight.

"Seems to me the old man's idea was about right. Get a thing as near perfect as you can and then leave it so the other fellow cannot monkey with the job. Of course that needs a good foundation at the outset."

This brings us back to the floor once more. The Berlin Machine Works, of Beloit, Wis., got into the new shop some time ago. The firm builds woodworking machinery and therefore can draw upon a fund of wood and metal-cutting knowledge. This is how the work of flooring was carried out. A layer of gravel was first put in and upon this the joists were laid. These joists were made of two two-by-fives, bevel sawed, so that the bottom was 4 in. wide and the top 2 in. About 4 in. of grout then was tamped between the joists and over this was laid about a half inch of cement. A coat of tar was applied on the top of the cement. The matched plank flooring of 2-in. hard pine was then laid and on top of this floor came 7/8-in. maple flooring, both end and side matched. The dimensions of the shop in which this floor was laid are 200 by 300 ft. Most of this space is used for erecting and testing purposes. A letter of inquiry to the firm obtained the opinion that, "We know of no way in which it could be improved, the wearing qualities are very good and there is absolutely no vibration."

It so happens that this question of floors came up for consideration at one of the New York meetings of the American Society of Mechanical Engineers and that discussion is worth repetition here.

Charles T. Newcombe, president and general manager of the Deane Steam Pump Co., of Holyoke, Mass., contributed the following experience:

"I do not know that I have any new notions, but my practice has been for the last seventeen years, for ground floors in a machine shop building steam pumps or like machinery, to use, for joist or floor timbers, 6-in. by 6-in. kyanized timbers placed 4 ft. on centers, well bedded in place, and laid crosswise of shop so as to put the plank lengthwise of shop. On top of the timber I put 3-in. matched spruce plank, planed on one side. Before the planks are laid the earth fillings under plank are well puddled for about two feet and left higher than floor timber, and struck off to height of floor timbers, leaving a solid surface under plank onto which machinery can be set without other foundations. It is my experience that this kind of floor will wear out on top in about five years, when it will be found to be rotted on bottom so as to need replacing, the kyanized timber lasting indefinitely.

"Kyanized timber or treated lumber can now be obtained very readily on the market. This kind of floor costs laid 11 cents per square foot, and is easily replaced, and in view of the fact that the top of floor wears out, it is in my opinion better to use this or similar cheap construction and have a new floor when needed.

"For second-story floors for such work as is usually put on such floors, I use 3-in. matched spruce plank with paper laid over it to keep the dust and dirt from passing through, the top flooring being 1⅛ in. thick, matched hard maple, bored and blind-nailed not wider than 3½ in. This kind of a floor will last many years, wearing out in spots only, for instance, where the chips in front of drill or planer are, and upon which the operator stands. The floor costs 14 cents per square foot laid."

Albert A. Cary, consulting mechanical engineer, New York, said: "I don't know whether I have very much to say in the way of new notions about machine-shop floors, but I have experimented with floorings in manufactories. I had a good deal of trouble where there is a great amount of trucking of heavy machinery and rather heavy, bulky articles. There our floors would wear out very rapidly. So I made up my mind to determine which was the best floor, and I laid a series of sections, starting with spruce, then putting in yellow pine, then taking a better quality of yellow pine, which I believe is known as "cone gray" pine, and afterwards maple, so that we had a chance to test them. I have forgotten the relative length of time that the different floors wore, but the final result was that I ripped up all other kinds of top-flooring course, and laid the maple floor, and I do not know anything that will wear any better than that. One thing convinced me of its splendid adaptability to a place of that kind where there is a good deal of trucking. I found that a number of piano warehouses had adopted it in this city. They roll heavy pianos with small casters constantly over the floor, and that was the one thing they found that would not grind under rollers and would stand. Of course, the poorer qualities of maple will grind under casters, but if you get a good quality of rock maple you cannot get any better floor for a machine shop, I think."

Mr. Durfee followed: "In one of the machine shops erected by me the lower floor we built in this way. We covered the surface of the ground, after it had been excavated, to a proper depth, with 10 in. of broken stone. In that broken stone we bedded some sills of chestnut and then filled the space between them with broken stone. The sills were flattened on their upper surfaces, and on them were laid 4-in. planks about 5 in. wide. The planks were placed with a slight open joint, not to exceed an eighth of an inch, sufficient to allow air to pass down through the cracks and to allow water thrown upon the floor to pass away. These planks were laid at an angle of 45 degrees with the traffic. I think that an advantage, because when you are hauling loads through the shop you are running at an angle to the grain of the wood. I do not expect to live long enough to see that floor wear out. The galleries of that shop were made of spruce plank, 4 in. thick and in no case over 8 in. wide, grooved for inserted tongues, and laid upon girders 10 ft. apart. On top of these planks was laid a hard pine floor 1⅛ in. thick, made of 1¼ stuff. It was not tongued and grooved.

I don't think tongued and grooved floors are suitable for machine shops. This hard pine flooring was what was called, in that locality, rip-sawed. There were no outside pieces of the log in the boards. The grain ran perpendicularly through the boards as nearly as possible. The edges were laid close and fastened by nails driven right through the boards. The upper boards were laid at an angle of 45 degrees to the plank below. That answered a double purpose. First, it diminished the wear of the floor by placing the grain of the wood at an angle of 45 degrees to the traffic over it; and secondly, it stiffened the building very much, because the galleries formed an immense horizontal truss to resist vibration. I have had a good deal of experience with the floors of factories. I have always found that where the floor—a top floor—was laid with tongued and grooved boards, the floor was practically all worn out when it was half worn out, so to speak. When the floor was worn down to the tongue, it was full of all sorts of disagreeable inequalities and had to be repaired very frequently. Then that is another point in laying hard pine or any other wood, unless you are careful to have the grain of the wood run perpendicularly to its surface. In other words, if there are slab grains in the wood these peel up and separate from the boards below. Then you have inequalities, arising from that cause, which are very disagreeable."

Mr. Cary at this point entered a demurrer to the following effect: "I do not know that I can agree entirely with Mr. Durfee as to the use of non-tongued and grooved flooring for a top floor. I have used that. I have never used anything over three inches in width, which was nailed down. When ordered, it was drilled to take wire nails and these were driven in just above the tongue so that they would hook up against each other. It is well seasoned wood and nothing over three inches in width. I have known these floors to last eight or ten years. They are not worn out now and they have had some pretty rough usage.

"There is another thing that may be a little out of order here. It is not directly a machine shop floor, but refers to the treads of stairs in factories. I saw something in Hartford a number of years ago and I have since tried it myself. There they take maple and make the tread out of wood, well, I should say an inch or an inch and a quarter thick. The ends of the boards are sawed off across the grain and this is so placed as to stand that grain up on the tread. That is cut up into little blocks 1 in. square and so placed on top of the tread. It is end wood. I know of one flight of stairs that I have laid that way. It has been trampled over for a great many years. It is in splendid condition, and the other stairs are worn away and new treads have to be put in; but that seems to wear for an indefinite length of time."

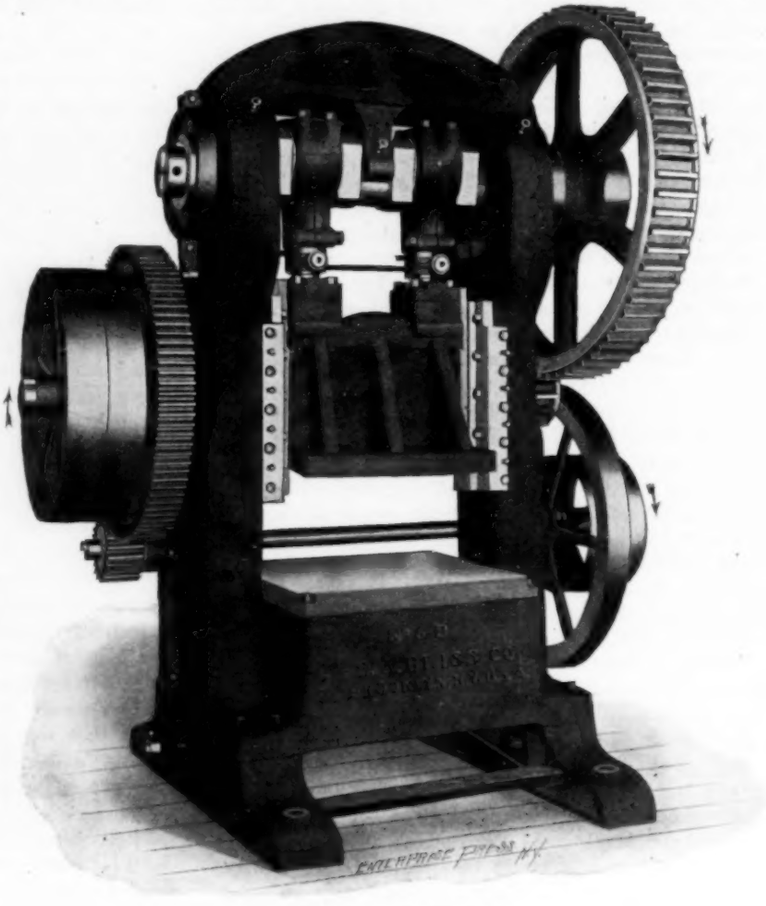
The following discussion was contributed by Percy A. Sanguinetti, consulting engineer, New York: "I would say, from many years of observation, that a floor composed of maple planks, with the joints laid diagonally with the walls of the building, made the most durable covering that I know of.

"A floor so laid, made of pieces not over 6 in. wide and 1¼ in. thick, all joints tongued and grooved, showed no injurious wear for about five years."

SPECIAL "BLISS DOUBLE CRANK PRESS.

The accompanying half-tone illustrates a new pattern double-crank press brought out by the E. W. Bliss Co., Brooklyn, N. Y.

The press is particularly adapted for very heavy stamping and forming, although as the slide is accurately guided in long bearings, the most delicate dies can be operated in it. Perfect alignment of the slide is maintained when adjusting for different heights of dies by means of a ratchet device, which simultaneously raises or lowers both ends of the slide. The frame is one casting of massive and solid construction; the shaft is hammered steel of high carbon and of large diameter, capable of withstanding the severe strains that are frequently put on a press of this character. It has a 6-in. stroke.



BLISS DOUBLE CRANK PRESS.

Double gearing with a ratio of 23.1 is employed on the press to give a slow, powerful motion to the slide. When greater speed is required, a belt is used on the pulley on the intermediate shaft. Provision is made for throwing the second pinion out of mesh, and the press is run single geared 5:1.

Some of the important dimensions of the machine are as follows: Opening in bed, 31 x 24 in.; distance between gibs, 35 in.; thickness of bolster plate, 3½ in.; height from floor to top of gear, 134 in.; area of die bed, 41 x 47 in. Weight about 40,000 lb.

It is reported in St. Petersburg, Russia, that the Krupps, of Germany are negotiating to acquire the Putiloff Iron Works, the scene of the political strikes and riots in the Russian capital.

PLATES AND MACHINERY.

Bids are Opened for Navy Yard Requirements—Prices In Wide Range.

(Special Correspondence.)

WASHINGTON, Oct. 17.—A number of firms well known in the trade were represented by the bids opened to-day at the Bureau of Supplies and Accounts of the Navy Department.

In the class calling for three steam windlasses, complete, to be delivered at the Mare Island Navy Yard within 70 days, the Hyde Windlass Co., of Bath, Me., was the only bidder, its bid being $2,625.

Three bidders submitted proposals for one improved two-spindle centering machine, complete, with three-jaw centering chuck, countershaft, necessary wrenches, drill socket, one-half dozen center drills and four center reamers, 60 degrees. The bids were: Compressed Air Mfg. Co., San Francisco, $124; Drew Machinery Agency, Manchester, N. H., $128.75; Pratt-Whitney Co., Hartford, Conn., $157.50.

For one two-motor three-ton electric traveling hoist, suitable for operation on a 220-volt direct current system at the Mare Island navy yard, California, proposals were submitted as follows: Case Mfg. Co., Columbus, O., $575; Curtis & Co., St. Louis, $1,005; Cleveland Crane Co., Wyckliffe, O., $1,150; Niles, Bement, Pond Co., New York city, $595; Pawling & Harnischfeger, Milwaukee, Wis., $895, and the Thomas Co., New York city, $787.50.

Bids were opened for a considerable range of steel supplies for delivery within 150 days at Pacific Coast navy yards within from five to eight months' time. On one class comprising 90 plates, aggregating about 19,551 lb. of mild steel, the bids were: Carnegie Steel Co., $719.48; Heller Bros. Co., New York, $860.24, and Hoffman & Co., Baltimore, Md., $606.08.

For 309,553 lb. of mild steel plates the proposals were: Carnegie Steel Co., $8,760.35; Heller Bros. Co., New York, $9,131.81, and Hoffman & Co., Baltimore, Md., $7,491.18.

Heller Bros., the only bidders in the class mentioned, submitted an estimate of $891.96 for supplying to the Puget Sount navy yard 7,650 lb. of medium steel angles; 5,175 lb. of medium steel channels; 5,513 lb. of medium steel I beams, and 4,485 lb. of light steel channels.

For furnishing 100 plates of medium steel, aggregating 21,347 lb., the proposals were: Carnegie Steel Co., $749.28; Heller Bros. Co., New York, $939.26, and Hoffman & Co., Baltimore, Md., $597.72.

For 145,382 lb. of medium steel plates of various sizes, ranging from 7½ to 20 lb. per square foot, the bids were: Carnegie Steel Co., $4,099.77; Heller Bros. Co., New York, $4,846.07, and Hoffman & Co., Baltimore, Md., $3,518.24.

For 195,000 lb. of rivet steel, bids were submitted as follows: Heller Bros. Co., New York city, $8,190; Hoffman & Co., Baltimore, Md., $6,318; Midvale Steel Co., Philadelphia, Pa., $9,262.50; Temple, Edwards & Co., New York city, $6,318.

For furnishing about 235,000 lb. of mild steel angles the offerings were: Carnegie Steel Co., $6,998.23; Heller Bros. Co., New York, $7,284.09, and Hoffman & Co., Baltimore, $6,880.81.

The greatest competition was evidenced in the case of proposals for furnishing 32 bars (71,945 lb.) of steel for davits at the Mare Island Navy Yard. The bidders and their estimates were: Bethlehem Steel Co., $3,417.39; Crucible Steel Co. of America, of Pittsburg, Pa., $2,388.57; Driggs Seabury Ordnance Corporation, Sharon, Pa., $2,590.02; Heller Bros. Co., New York, $3,535.30; Hoffman & Co., Baltimore, Md., $2,374.18; J. B. Kendall, Washington, D. C., $2,590.02, and Midvale Steel Co., Philadelphia, Pa., $3,223.14.

Half a dozen firms submitted proposals for furnishing for use at the Boston navy yard, Boston, Mass., within 60 days of date of contract, one locomotive crane of 10 tons capacity. The bids follow: Browning Engineering Co., Cleveland, $4,551.75; Brown Hoisting Machinery Co., Cleveland, $6,000; Dodge Coal Storage Co., Philadelphia, $6,100; Industrial Works, Bay City, Mich., $4,886; North Penn Iron Co., Philadelphia, $7,000, and the Wellman-Seaver-Morgan Co., Cleveland, $5,696.

TREND OF IRON AND STEEL WAGES.

A comparative statement of the number of laborers in the iron, steel and foundry industries from 1890 to 1904, with the number of hours worked per week and the average wages paid for that period, has been issued by the United States Bureau of Labor.

As compared with the average for the years from 1890 to 1899, the number employed in 1904 showed a heavy increase, but with a week shortened from 2 to 18 percent and wages for the week from 10 to 33 percent higher. The year 1903 made even a better showing from the workman's standpoint. The South Central and Western sections paid the highest wages in foundries and machine shops, the North Central section the highest in other lines of iron and steel making.

In the manufacture of bar iron and steel fewer men were employed in 1904 than in 1903, the hours were shorter and the wages on an average about three cents less per hour. In the Bessemer converting industry practically the same number of men were employed, but the hours worked were in some cases considerably less and wages decreased from 5 to 11 cents per hour. Blast furnaces employed about the same number and worked them about the same time, but paid wages averaging one cent an hour less. In foundries and machine shops employes were considerably fewer in 1904, the number of hours worked was practically the same and wages were slightly increased.

Competition Must be Open.

(Special Correspondence.)

WASHINGTON, Oct. 25.—Considerable significance attaches to the decision just reached by Secretary of the Navy Bonaparte to reject all proposals for furnishing boilers for the new Naval Hospital at Washington, on the ground that there is no competition for this contract under existing conditions. The specifications in the premises describe but one make of boiler, owing to a recommendation of the Bureau of Medicine and Surgery that the award be made to the Babcock & Wilcox Co. In conjunction with the secretary's decision this recommendation is now withdrawn. The action taken is due to the protest of the Stirling Co., which called the attention of the secretary to the general purchase of Stirling boilers by the Bureau of Yards and Docks and the Bureau of Equipment of the Navy Department. As a result of the turn of affairs above outlined new specifications have been prepared and a readvertisement for bids will take place.

"The Value of Analysis," a handsome booklet issued by the Columbus Iron & Steel Co., Columbus, O., condenses in small space a large amount of valuable information concerning the chemical and physical properties of pig iron. The various mixtures necessary to produce the different grades of iron are discussed in a way to appeal to the non-technical man as well as to the specialist. The discussions are illustrated by sample analyses of the "Buckeye Brands" of iron, the company's manufactures.

NEWS FROM MANY INDUSTRIES.

New Buyers :—

The American Spiral Pipe Works, Chicago, has increased its capital stock from $175,000 to $300,000.

The Central City Foundry & Machine Co., Central City, Tenn., has been incorporated with $15,000 capital stock.

The Railway Lock Nut Co., Waukesha, Wis., has been incorporated with a capital of $50,000 by Ransom Bailey, Harry E. Kepler and Della Huntington.

The Dyer Axle Lock Nut Co., Boston, has been incorporated to deal in axle lock nuts. The capital stock is $5,000. The president and treasurer is Edwin E. Stevens, Boston.

The Elmira Machine Works, Elmira, N. Y., has been incorporated with $10,000 capital stock. The directors are: J. H. Eastgate, D. C. Giles and Mary C. Eastgate, Elmira.

The Schock Machine Co., South Bend, Ind., has been incorporated with a capital stock of $20,000. The directors are: George W. Schock, Lura Schock and Olive Schock.

The Joseph Reid Gas Engine Co., Oil City, Pa., has been authorized to do business in Ohio. S. R. Shoup will be in charge of the office at Marietta, O.

The Niagara Forged Steel Co., Buffalo, N. Y., has been incorporated with a stock of $10,000 to manufacture metal and other goods. The incorporators are: George M. Stowe Jr., C. L. B. Tyler and others, all of Buffalo, N. Y.

The Colorado Drill & Machinery Co., Denver, Colo., has been incorporated with $100,000 capital stock. The incorporators are: H. W. Stone, William Liebrick and S. A. Osborn.

The Morrow Mfg. Co. has been incorporated at Wellston, O., by Jerry Morrow, Will P. Morrow, H. C. Morrow, and J. H. Morrow, to make trolley wheels and other specialties. The capital stock is $25,000.

The Morse Brothers' Machinery & Supply Co., Denver, Colo., has been incorporated with $250,000 capital stock. The incorporators are: George P. Morse, B. P. Morse and D. G. Dalton.

The G. H. Curtiss Mfg. Co., Hammondsport, N. Y., has been incorporated to manufacture motors, motor cycles, etc. The capital stock is $40,000, and the incorporators are: Glen H. Curtiss, Linn D. Masson, Aaron G. Pratt, Monroe Wheeler and Ray G. Hall, all of Hammondsport, N. Y.

The Calumet Railroad Appliance & Supply Co., Chicago, has been incorporated with a capital stock of $10,000 to manufacture railway supplies. The incorporators are: William T. Holderman, Louis M. Heintz and Frederick Sommer.

The National Heating Appliance Co., Utica, N. Y., has been incorporated to manufacture heating appliances. The capital stock is $15,000. The incorporators are: F. R. Switzer, 115 Genesee street; W. H. Switzer, same address; both of Utica, N. Y.; F. M. Penney, Whitesboro, N. Y.

The Stackhouse Mfg. Co., Buffalo, N. Y., has been incorporated to manufacture surgeons' and physicians' instruments, etc. The capital stock is $75,000, and the incorporators are: Oswald C. Stackhouse, John B. Uster, Elmer J. White and William P. Drake, all of Buffalo.

The Manufacturing Equipment & Engineering Co., has been incorporated to construct and equip buildings. The capital stock is $100,000. The officers are: President, Robert H. Leland, 209 Washington street, Boston; treasurer, John L. Carson, 138 St. James Place, Buffalo, N. Y.; clerk, Frank E. Ross, 69 Warren street, Lynn, Mass.

The Montauk Engineering Co., New York, has been incorporated to manufacture thrust bearings, oil cups, etc. The incorporators are: James A. Anderson, No. 233 East Twenty-first street; Reginald E. Jordan, No. 120 West Ninety-fourth street, both of New York, and Frank L. Haggerty, No. 922 Eighth avenue, Brooklyn.

The Japanese & Eastern Corporation, Ltd., has been incorporated in London, Eng., with a capital of £5,000,000 for the purpose of financing important undertakings in Japan and the far East. The company will also act in an advisory capacity in regard to such projects as tramways, electric lighting and power, railways, docks, etc.

The Stover Engine Works, Freeport, Ill., have changed their form of organization from a firm to a company with a capitalization of $120,000. The officers are: President, D. C. Stover; vice president and treasurer, P. S. Stover; secretary, J. F. Smith and superintendent, P. F. Schreyer. The plan is to extend the business over a still larger field.

Fires:—

The plant of the American Can Co., Davenport, Iowa,, which was recently badly damaged by fire will be rebuilt and restored to its former capacity.

A large number of costly tools were destroyed in the fire of Oct. 16, which caused the $35,000 loss to the Stevens Mfg. Co., London, Ont.

On Oct. 15 the plant of the Central Car Wheel Co., Allegheny, Pa., sustained a loss by fire of $75,000 in the foundry addition to the main building.

By the explosion of five tons of molten metal at the Illinois Steel Co.'s plant, Chicago, Oct. 17, one laborer was killed outright and several others were badly burned.

Fire in the plant of the J. B. Carr Chain Co., Troy, N. Y., caused a loss of about $12,000 Oct. 11. The blaze started in the chain storage room. A set of valuable machinery in the testing room was wrecked.

The American Radiator Co.'s plant at Buffalo, N. Y., sustained a loss of $3,000 by a fire in the molding department Oct 17. The blaze was caused by sparks from one of the furnaces.

The forge department of the McKay Chain Works, McKees Rocks, Pa., was totally destroyed Oct. 18 by fire supposed to be of incendiary origin. Considerable valuable machinery was wrecked. Only the most energetic work of the firemen prevented the destruction of the other departments.

New Construction:—

The Dicke Tool Co. is rebuilding its shops at Downers Grove, Ill., recently destroyed by fire.

The Western Foundry Co., Chicago, is to increase its plant by the erection of a building 250 x 115 ft., at a cost of $240,000.

The Manufacturers' Foundry Co., Waterbury, Conn., is two erect two new buildings, one of brick and one of frame.

The Connellsville Machine & Car Co., Connellsville, Pa., is to erect a new plant to replace the one destroyed by fire some months ago.

The Ross-Meehan Foundry Co., Chattanooga, Tenn., is building two annealing ovens and a core making and storage shop 110 x 65 ft.

The Schoen Steel Wheel Co. expects to complete the addition to its plant at McKees Rocks, Pa., before Jan. 1. Further additions are contemplated for next year.

Work has been started on the steel bridge which will span the Clearwater river at Lewiston, Idaho. Erickson & Peterson have the contract.

The new plant of the Kellogg-McCrum-Howell Co., Blairsville, Pa., will include a factory building 102 x 350

ft., a machine shop 50 x 257 ft., an enameling room 55 x 257, a warehouse 80 x 300, a power house and a milling room. Considerable equipment will be needed.

The Maher & Flockhart Foundry, Newark, N. J., now has a capacity of 50 tons per day, which has lately been increased by building an addition to the plant.

The Standard Machine Co., Mystic, Conn., is building an addition to its foundry, which when completed will result in a greatly increased capacity.

The Somerville Iron Works, Somerville, N. J., has added another pipe foundry, increasing its capacity to 80 tons per day.

The United Shoe Machinery Co., Beverly, Mass., is preparing for an increased output by the erection of a large new foundry.

The Illinois Malleable Iron Works, Chicago, have let the contract for the new branch factory building 60 x 200 ft., five stories, to be erected at Diversey boulevard and the Chicago & Northwestern tracks at a cost of $75,000.

The Gleason Co., Rochester, N. Y., has work well under way on a foundry building 110 x 410 ft., of steel and concrete block construction. Other buildings under contract will increase the cost of the plant to more than $300,000.

The new buildings of the Atlas Wire Co., Peoria, Ill., are practically all under roof and the heavy machinery is going into place. Operations will be begun within a month and about 100 men will be employed.

The new Ensley furnace of the Tennessee Coal, Iron & Railway Co., which will be completed early in December will increase the capacity of the plant to 2,500 tons per month. Work of rebuilding furnace No. 5 is progressing rapidly.

The United Steel Co., Canton, O., is building an addition to its plant consisting of a steel building 80 x 180 ft. and two smaller structures. Electric cranes and other modern appliances will be installed. The company is preparing to make a specialty of universal mill plates from 14 to 48 in. wide and up to 80 ft. in length.

At the Sharon plant of the American Steel Foundries, work is being rushed on improvements to cost about $100,000. New equipment consisting of heavier cranes and new air compressors will be installed and a new shipping and cleaning department erected. The capacity of the plant will be almost doubled.

The contract for the excavations and filling on the site of the rolling mill that is to be erected in Bristol, Tenn., has been let to R. Horneck. The rolling mill, which is that of the Virginia Iron, Coal and Coke Co., now located at Max Meadows, Va., is being dismantled and loaded on cars, preparatory for shipment to Bristol.

The rolling mills of the Western Iron Mills Co., near Burnham, Colo., have been completed and are ready for operation. They will turn out 100 tons a day of manufactured iron in rails, bars and angles, scrap iron being utilized. The new plant represents an investment of $250,000. Warren C. Bogue, for many years superintendent of the Mine & Smelter Supply Co., is general manager.

The National Acme Mfg. Co., Cleveland, is soon to begin the construction of a 4-story brick and steel building which it expects to occupy early in 1906. This will more than double the present capacity of the plant and afford further relief from the crowded condition of all departments which were only temporarily relieved by the 4-story addition built during the past summer. The company is finding a world wide market for its multiple spindle screw machine and products. Orders have been booked recently for delivery to Europe, Asia and South America. New York, Boston, Chicago and European offices are maintained.

General Industrial Notes:—

The Gibby Foundry Co. has purchased the property of the Bay City Dredging Co., Boston.

At the Pacific Electric Railway shops, Los Angeles, Cal., the first passenger cars to be built on the coast are now being completed.

John W. Porter has been appointed receiver for the Ohio Steel Erecting Co., Steubenville, O., a $50,000 Delaware corporation.

The Sidney Tool Co., Sidney, O., manufacturer of forges, drills, wood working machinery, etc., has purchased the plant of Sebastian-May Co.

Workmen are overhauling the plant of the Rockaway Rolling Mill, Rockaway, N. J., preparatory to putting it in operation.

The plant of the Standard Chain Co., Braddock, Pa., which employs about 400 skilled workers, has resumed operations as an open shop after a four months' strike.

The Bourne-Fuller Co., Cleveland, has recently installed a new five-ton crane in its storage yards. An extension of the crane track permits of easy access to any part of the yards.

Improvements costing $200,000 are to be made to the Sharon coke and gas plant, connected with the Carnegie Steel Co. plants in Sharon and South Sharon, Pa.

The Florence Machine & Railroad Supply Co. has been reorganized at Florence, Ala., and has purchased the Hoxie-Kells machine shops for the manufacture of a patent cattle guard.

Twelve thousand breaker boys between the ages of 10 and 16 are affected by the new law of Pennsylvania, forbidding the employment of all under 14 outside the anthracite mines and boys under 16 inside the mines.

St. Petersburg dispatches state that several American machine manufacturing firms are soon to establish branches in St. Petersburg, Moscow and other Russian trade centers.

The Carnegie Steel Co. has purchased ten additional acres of land in the manufacturing district of New Castle, Pa. The report is that this is to be utilized as a terminal for the Bessemer railway.

The Western Launch & Engine Works, Michigan City., Ind., has increased its capital from $30,000 to $100,000 in order to meet the demands of its foreign trade which has greatly increased of late. The old directors have been retained.

The Japanese government is educating in this country a number of men whom it expects to place in charge of a steel plant in the Orient. T. Kairai, one of these men, has been inspecting western plants during the past week.

The International Harvester Co. has purchased the Vulcan Works, near Noorkoeping, Sweden, and as a Swedish corporation will manufacture harvesting machinery.

The Flagler Iron & Steel Co., Chicago, states that it will not abandon its Kloman mine at Republic, Mich., but will resume working the property as soon as matters now pending can be arranged.

Structural steel towers 150 ft. in height, will be erected on either side of the Kennebec river at Kennebec, Me., for the support of huge cables, which will carry power across the river for the A. W. & G. railway.

The Electric Railway & Tramway Carriage Works Co., Preston, Eng., has absorbed the Castle Car Works at Hadley, and the British Electric Car Co., has been reorganized as the United Electric Car Co.

The Carnegie Technical Schools, Pittsburg, are preparing for night classes. Those who have failed in the examinations for the day schools now in operation may take examinations for entrance to the night classes.

The Ironton Disc Plow Co., Ironton, O., has reorganized by electing H. A. Marting, president; H. L. Anderson,

vice president; Otto Lintner, secretary and T. F. Walker, general manager. The company has recently added largely to its lines of production.

The Kane Cutlery Co., Kane, Pa., recently incorporated, is erecting a factory building, and for equipment will need drop and punching presses, shafting, belting, lathe, drill press, shaper or milling machine, power hacksaw and a gas engine of about 35 h. p.

Bondholders of the Delaware River Steel Casting Co., Media, Pa., are expected to purchase the splendidly equipped plant of that company, which has been in the hands of receivers for some time. The court's permission for the sale of the real estate of the company has already been asked.

Alexander Thomas, secretary of the Crucible Steel Co., is en route to the Orient to establish agencies in Japan, Korea and China. This is in line with the policy of foreign trade extension announced at the recent annual meeting of the company.

The B. F. Sturtevant Co., of Boston, Mass., is equipping the University of Illinois with economizer and mechanical draft apparatus specially arranged for experimental purposes, but serving also all practical requirements for continuous operation.

The Geneva Coke Co. has sold its plant near Masontown, Pa., to the McKeefrey Coal Co. for a consideration of $165,000. The new owner will build about 70 new coke ovens at once, increasing the plant to 200 ovens. The McKeefreys, as the Salem Iron Co., own the Seneca furnaces at Leetonia, O.

Two large coal deals have recently been consummated in Western Pennsylvania. Isaac Seamans, of Uniontown, has purchased 1,000 acres of coal lands near Washington, Pa., at $100 an acre and G. W. Grove, representing St. Louis capitalists, paid $15,000 for a large tract on Cobun's creek, Monongahela county.

President A. C. Dinkey, of the Carnegie Steel Co, with E. E. Flick, I. W. Jenks and N. M. Peterson, superintendent of the Mingo Junction and Bellaire plants, made a thorough inspection Oct. 19 of the plant recently started at Columbus after a long idleness. It is reported that improvements are contemplated.

The estate of the late Henry W. Oliver will develop its coal lands near Uniontown, Pa., by the construction of a 400-oven coke plant. This will practically adjoin the other works of the Oliver & Snyder Co., but will be operated separately by the estate and not the company. A tract of 400 acres is to be developed and adjoining lands may be secured and worked at the same plant.

The Uniontown & Wheeling Short Line Railroad Co., which has just been organized, will build a line from Wheeling, W. Va., across Green county to the center of Fayette county, Pa. It will tap the mineral riches of Green county and will afford the Wheeling district easy access to the Connellsville coke region. It will reduce the distance from the Connellsville field to Wheeling more than 50 miles.

The Schuylkill Coal & Iron Co., a new Pennsylvania corporation, which recently purchased the Navigation and Donaldson coal tracts near Pottsville, has also purchased the coal property of the Albright estate near Llewellyn, the Chamberlain tract near St. Clair, the Thouron tract and the Schall-Banan tract. Its holdings near Pottsville now aggregate almost 3,000 acres.

The Georgia Iron & Coal Co., Atlanta, Ga., is making extensive additions and repairs to its furnace at Rising Fawn, Ga., and large improvements at its coal mining plant at Cole City, Ga., besides installing an entirely new ore washing plant at its brown ore mines. This washing plant is novel in design and operation, preparing the ore in better shape and with less loss than has been possible before. These improvements will be completed by Dec. 1.

The Pratt & Whitney Co., machine tool maker of 136-8 Liberty street, New York, has purchased a plant at Dundas, Ont., for the manufacture of taps, reamers, milling cutters, punches, dies, etc. Machinery now being installed will also provide for the manufacture of a full line of twist drills. The factory is located near that of the John Bertram & Sons Co. recently purchased by the Niles-Bement-Pond Co.

The officers of the Kelly Mfg. Co., Waterloo, Iowa, which recently acquired the plant of the Tallerday Steel Pipe & Tank Co. are: C. F. Kelly, president; C. D. Kern, vice president; G. N. Cousins, secretary and H. S. Kelly, treasurer and manager. Such new machinery as is needed at once will be built in the company's factory at Goshen, but the plan is later to install machinery for bending sheets No. 10 and lighter and a 10-in. slip joint bending roll.

Trade Notes:—

The contract for the steel work in the bridge to be erected across the Ohio river at Ironton, O., was let Oct. 19, to the American Bridge Co.

The Chicago Pneumatic Tool Co. reports having received more than 2,500 orders during September. Air compressors form a considerable part of the business.

The Lebanon Valley Iron Co., Lebanon, Pa., has placed an order with the Brown Engineering Co., Reading, Pa., for a complete electric plant at its iron mills.

The King Stove & Foundry Co., Atlanta, Ga., has acquired the Lizzie Lowman stove foundry and organized the King Stove Mfg. Co. The plant is to be enlarged.

The Reading Iron Co., Reading, Pa., is constructing a large cane sugar mill for shipment to San Juan, Porto Rico.

The Russel Wheel & Foundry Co., Detroit, Mich., will furnish the 3,000 tons of steel needed for the Murphy power building in that city.

The Wash & Weidner Boiler Co., Chattanooga, Tenn., is building a 125-ton furnace for the Chattanooga Furnace Co., and is working on a large order of corrugated furnace boilers for the Tennessee Coal, Iron & Railroad Co.

The Chandler & Taylor Co., Indianapolis, has secured orders for its standard service self-oiling engines for the New York Life building in Chicago, a simple engine; and a tandem compound for the University of Nebraska, Lincoln.

R. D. Nutall & Co., Pittsburg, have recently installed one of the largest gear cutting machines for milling gear teeth that is manufactured. The machine will allow the cutting of spur gears up to 20 ft. in diameter and 3 ft. face, and up to 7-in. pitch tooth.

The William B. Pollock Co., Youngstown, O., is building considerable of the equipment for the new Bessemer steel plant of the Youngstown Sheet & Tube Co. The contracts include two 10-ton Bessemer converters complete, four steel works cupolas and eight 10-ton steel ladles.

The Westinghouse Electric & Mfg. Co., Pittsburg, is filling a large equipment order for the Consolidated Railways Co., New Haven, Conn., and has received the contract for 80 double equipments at 75 h. p. each for the South Side Elevated Railway Co., Chicago.

The Savage Mountain Fire Brick Co., Frostburg, Md., which makes a specialty of brick for rolling mills, has opened a new mine at a cost of about $10,000 and increased its yard capacity one-third. The plant was established in 1864. A rush of orders has taxed its capacity to the utmost for some time past.

As a result of a recent test of pneumatic hammers by the Jones & Laughlin Steel Co., Pittsburg, an order has been placed with the Dayton Pneumatic Tool Co., Dayton, O., for 30 No. 3 Green chipping hammers. The Dayton company has also received an order for 38 Green hammers of miscellaneous sizes for shipment to Japan.